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DEVELOPMENT DIGEST

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Errata: In the issue of July 1976, Volume XIV, No. 3, the following correction is required.

Page 106: In the citation of the reference to the book by Theodore H. Moran, Multinational Corporations and the Politics of Dependence: Copper in Chile, the copyright should read 1975, not 1974.

(Unless otherwise indicated,
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DEVELOPMENT STRATEGIES

INDIAN FARMER PLOWING FORMER SWAMPLAND IN TERAI AREA FOR SOWING. (PHOTO: UNITED NATIONS)

New Growth Strategy for India and the Developing World

John W. Mellor

[The author proposes a growth strategy, delineated for India in the 1970s but applicable elsewhere, which gives a leading role to increased output of foodgrains through technological innovation, and stresses labor-intensive dispersed units within industry. Its goal is to maximize employment while attaining what should be a higher national growth rate than under prior policies.]

The focus of the development strategy outlined here is on increased employment, and on a greater participation of the poor in economic growth rather than the redistribution of existing output. In India specifically, but more generally in the less developed world, past growth has done little for the poor. The emphasis on employment reflects an optimism that growth can be restructured to provide more jobs for more people, even though powerful interest groups will not relish the complex economic changes and political decisions necessary to implement the chosen strategy.

For the past two decades, India has been the object and source of alternating attitudes toward economic development. The Second Five-Year Plan (1955-60), developed by P. C. Mahalanobis, turned away from earlier growth strategies that emphasized labor mobilization and small-scale production toward one that stressed the acquisition of capital goods and modern industrial power, an emphasis which continued through the 1960s. A decade and a half later, Indira Gandhi's 1971 electoral appeal to the masses coincided with a worldwide shift in concern back to direct emphasis on employment. Then, a renewed search began

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for means of integrating increased employment and a broadened distribution of income into a basic blueprint of economic growth.

The theory behind the Mahalanobis plan was elegantly simple, internally consistent, and suitable to an economy presumed to have poor prospects for agricultural and export growth. The source of growth was capital goods, and the means of growth was the allocation of resources for their acquisition. It was recognized that poverty and welfare considerations would limit the initial proportion of the economy's resources which could be distributed to capital goods rather than to consumer goods necessary to subsistence. However, the increase in output from the initial allocation of resources would largely be saved and reinvested in more capital goods production. Over time, an increasing proportion of national output would be saved and invested and hence the rate of advance would accelerate. In this theory, as long as growth in output is to be maximized it is important that growth in employment be minimized, since employment requires wage payments which in turn add to consumption and divert resources from producing capital goods. Mahalanobis' conceptualization was tied in with the tradition of economic growth theory developed in the context of western high-income countries by Roy Harrod and Evsey Domar, and by G. S. Feldman for the autarkical growth strategy of the Soviet Union. These theories led in practice to a capital intensive, low-employment strategy that had little role for investment in a dynamic agriculture. The bulk of resources were to be channeled into the set of large-scale industries -- most notably steel and machine building -- generally identified with modern world power.

As with similar strategies in other countries, India's development plans have produced much slower growth than expected, and even that growth rate was substantially dependent on foreign aid. The poor did not benefit significantly from the ancillary programs for rural development and cottage industries. On the more positive side, a large infrastructure of growth institutions and a broad industrial sector were built which could, in the future, facilitate a more effective strategy of development. Most important, one of the world's largest, poorest, and most stagnant economies was thrust into a process of expansion which might later be steered in a more productive direction. Although the overall rate of advance was slow, the structural changes within that advance were immense.

According to official Indian statistics, per capita national income, expressed in constant prices, grew at an annual rate of only 1.1 percent from 1955/56 to 1959/60 and 1.4 percent from 1960/61 to 1970/71, with an increase of 20 percent over 15 years. The rate of growth was faster during the Third Plan period (1960 to 1965), when foreign aid rose quickly, than in either the preceding decade or in the subsequent drought afflicted years when foreign aid declined rapidly. For the fifteen years from 1955/56 to 1970/71, foodgrain production increased at an annual rate of about 3 percent (compared with only 0.11 percent

in the five decades preceding independence). Industrial production rose at a rate of 6.5 percent in the same period. The production of investment goods was particularly strengthened, rising to 21 percent of industrial value added in 1963 compared to less than 7 percent in 1951, while consumer goods' share of value added declined from 58 percent in 1951 to 38 percent in 1963. The least satisfactory aspect of Indian economic performance was the degree of participation of the poor. In the fifteen years following inception of the Second Plan, total employment in the Indian economy probably grew no faster than population; per capita incomes of the lower third to half of the inhabitants certainly did not increase and may well have declined. This lack of participation of the poor in growth was a worldwide phenomenon of economic development in the 1960s, and has been extensively noted in the increasing international concern for employment and income distribution.

By the early 1970s, political and economic evolution suggested the need for a change in growth strategy. There was imbalance between agriculture and industry - an imbalance created by the increased demand arising from growing success in industry, masked by rapid growth in food aid during the 1960s but dramatized by the terrible droughts of 1965/66 and 1966/67. There was imbalance between investment in the public sector and the ability of the political system to create public sector resources or to draw them from the private sector. There was a general imbalance developing between growth in investment and growth in domestic savings as well as in the proportion of investment and savings originating in the private corporate sector. There was a growing imbalance between the demand of the industrial sector for import of machinery and raw materials and the ability to export, or to attract increasing foreign aid. Perhaps most important, there was an imbalance between the nascent power structure implicit in a broadening electorate and the actual power structure of the current political representation and of the government administrative services.

In retrospect, the decade of the 1950s can be seen as a period of political and economic foundation laying. The first half of the 1960s was a time of accelerated growth which would begin to bring the contradictions in the system to the surface. The drought and the decline of foreign aid in the last half of the 1960s would then emphasize the need for a choice either to reinforce the old strategy of development or embark on a new one.

The New Strategy

The major theses of a consistent strategy of employment-oriented growth are conceptually simple. Income of the poor is determined by both the pace and the pattern of national production, which in turn determine the rate of growth of employment. It is through increased demand for labor that the poor participate actively in development. However, additionally employed labor must be productively used

if it is to generate the income necessary for improved levels of living and the capital requisite for continued advance in employment. Economic progress may be a necessary condition for increased income to the needy, but it certainly is not a sufficient condition.

Substantially raising incomes of the poor necessarily increases their effective demand for food and, short of massive redistribution, requires rates of increase in food production far in excess of those achieved under previous strategies of growth. Increased food supply is thus the prime production component of increased welfare of the poor. Within the usual economic and political context, necessary increases in food supply can only occur through technological innovation which normally distributes the initial benefits largely to the already more prosperous rural people. This initial increase in rural income sets in motion a sequence of multiplier effects which can stimulate expanded production and employment in other sectors of the economy. These processes increase the relative importance of consumer goods industries and small-scale enterprises. Such industries tend to be less capital intensive than those emphasized in the earlier strategy and tap sources of savings not otherwise developed. They also require increased imports and facilitate increased exports. As an alternative to a capital intensive strategy, this employment-oriented approach has potential for a faster rate of growth in total income as well as for greater participation of the poor in the benefits.

The changes requisite to the employment-oriented strategy may be impeded or stopped at numerous points by difficulties in making the necessary institutional modifications and by political resistance from the vested interests in the old strategy. Success requires an altered approach to planning, setting of new investment priorities, and vigorous institutional change. None of this is particularly simple or more palatable than pursuit of the old strategy.

In practice, shift to an employment-oriented strategy for India as for other countries requires four substantive elements of change. First, it must give priority to increasing agricultural production through investment in new technology. Second, it must reduce the capital requirements per employee in the industrial sector and tap new sources of capital through decentralization of production. Third, to expedite the decrease in capital intensity, the growth rate of both exports and imports must increase. Fourth, planning and administrative procedures and institutions must also be decentralized, and emphasis switched from regulatory to facilitatory procedures. These changes have profound implications for both domestic and international politics; as in the 1950s, the choice of strategy may depend primarily on these political considerations.

The Pivotal Role of Agriculture. The full role of agriculture in an employment-oriented strategy and the crucial conditions of its fulfilling

that role are so little understood that they must be spelled out in some detail. Agriculture performs two key, related functions in the new approach. First, because foodgrains make up the bulk of marginal expenditures among the poorer classes, agriculture provides the physical goods to support increased employment and higher wage earnings. In other words, the agricultural sector is a crucial source of wage goods -- the goods purchased with wages. And, it provides much of the increase in employment -- directly through raising agricultural production, indirectly through the stimulus of increased income to the cultivator class and the demand effects of the consequent expenditures. Because of the conditions of agricultural production, these functions can be effectively fulfilled only if agrotechnical innovations are developed and applied. Increased agricultural production, based on cost decreasing technological change, can make large net additions to national income and place that income in the hands of the cultivator classes, who tend to spend a substantial proportion of it on nonagricultural commodities. Agriculture may thus provide a demand drive for development, similar to that often depicted for foreign markets in export-led growth.

In a peasant agriculture such as that dominating the bulk of Asia and Africa, the consumer goods industries that are stimulated by increased rural incomes are likely to be relatively labor intensive. Expansion of production by the wealthier landowning classes results in increased marketing of food, and increased cash incomes to farmers from the marketings of that food. These bigger cash incomes provide a demand for increased nonagricultural production, and a resultant rise in employment. The expanded employment of the lower-income laboring classes, who spend the bulk of increased income on food, provides the demand for additional food production. Indeed, if an increase in employment of lower-income people does not accompany the increased agricultural output there will be inadequate demand, and agricultural prices may decline sufficiently to discourage continued growth of production. Accelerated growth of agriculture is an important requirement for a high-employment policy; at the same time a high-employment policy is an important requirement for sustaining rapid growth rates in the agricultural sector. This important interrelationship requires the assistance of astute government policy if it is to work smoothly and effectively.

Unfortunately, agriculture has traditionally had difficulty in fulfilling either of its two roles in an employment-oriented strategy. Because of a relatively fixed land area and consequent diminishing returns to greater use of other production inputs, agriculture has tended to experience rising costs of production and decreasing productivity of labor and other non-land resources as output rises with little or no change in technology. These increasing costs require that, over time, more and more capital and other resources be transferred

to agriculture to achieve a given growth in production. The mounting costs of production are likely to be reflected in relatively higher agricultural prices. Under these conditions, pyramiding agricultural prices have two deleterious effects. The upturn in food costs, and hence of wage goods, discourages labor intensive development. Similarly, growth in agricultural output through cost-increasing methods in the long run detracts from potential national income gains in other sectors by more than is added in agriculture. Thus the multiplier effects of increased agricultural income are unlikely to provide a net addition to development. It is this unfortunate and common state of affairs in agriculture which provides the most important justification of the Mahalanobis model of growth.

There are three ways, other than massive redistribution of wealth and income, to deal with rising costs of production in the agricultural sector: agricultural imports, rationing, and cost-decreasing technological innovations. Increased imports would exacerbate an already difficult foreign exchange problem and make the country dependent on foreign sources for a critical element of survival. The rationing approach is politically difficult because of the power of the middle- and upper-income classes whose consumption must be constrained, and administratively difficult because of the large numbers of people to be reached. Where it is feasible, the introduction of yield-increasing technological methods in agriculture can reduce costs of production, allowing increased demand to be met without increased prices, while real incomes of rural people rise. It is a superior alternative to imports and rationing, but it will cost money. Technological advance in agriculture requires research. There must be massive investment in the physical infrastructure of rural communication and irrigation systems as well as the institutional infrastructure for servicing agriculture with research, education, credit, input supply, and marketing systems. There must, in addition, be large expenditures on fertilizer and insecticides, in most cases requiring substantial allocation of foreign exchange.

It is thus the dominance of agricultural commodities as wage goods and the large supply of labor available for mobilization which combine to make creation of a modern, technologically dynamic agriculture so important to economic growth and to the participation of the poor in that growth.

New Industrial Strategy. With success in agriculture, a new strategy for industry must conserve capital and tap new sources of savings. In the new approach, pressure on capital supplies arises from the additional needs for agricultural development combined with the large growth in employment. Compared to the capital intensive strategy, the new industrial plan will increase the relative importance of consumer goods and small-scale, decentralized industries, and will require larger

imports of capital intensive products and enlarged exports of labor intensive products.

Consumer goods often offer a wider scope for labor intensive production than capital goods. This is particularly true, as in India, where the relevant comparison is between consumer goods purchased by peasant farmers in the new strategy with capital goods produced in large-scale modern industries under the old strategy. Increased demand for consumer goods is an outgrowth of the rising rural incomes associated with accelerated technological change in agricultural production, and industrial policy must then facilitate expansion of consumer goods production. Rising rural incomes increase demand in rural areas, and thereby encourage decentralization of production to those areas. Higher rural incomes and production encourage investment in the infrastructure of transportation, communication, and electrification, all of which are important to the development of small-scale industries. And, the higher incomes in rural areas provide a larger pool of potential savings for investment in local, small-scale industries. The generality of this argument is perhaps most strikingly illustrated by its vigorous application in the People's Republic of China during the past decade.

Increased international trade is a necessary part of an employment-oriented industrial strategy. Both the agricultural and the industrial growth crucial to the employment-oriented strategy require large quantities of intermediate products produced with highly capital intensive processes - for example, fertilizer and pesticides for agriculture; and steel, petrochemicals, and synthetic fibers for industry. Domestic manufacture of these products will divert vital capital from agriculture as well as from the relatively labor intensive industries which must provide the bulk of employment. A substantial proportion of such products must be imported. Increased exports are then required to pay for the imports of capital intensive products. Fortunately, increased exports are expedited by the strategy, which raises the supply of wage goods and hence of relatively low-cost labor. It is in such labor intensive exports that India and other low-income nations have a potential competitive advantage relative to higher income nations in the world markets. Increased domestic demand from the more prosperous rural areas will further speed the growth of labor intensive output and prepare more firms for export competition if their supplies of production resources are assured. The unfavorable trade record under the capital intensive approach does not indicate poor prospects under a labor intensive approach. Indeed, it is clear that, as has so often been the case, the prophecy of inferior export performance for India's Second Plan was self-fulfilling since resources were largely committed to capital intensive production in which India was necessarily in an inadequate competitive position on world markets. It should be remembered, however, that as the capacity to trade of low-income countries such as India increases, high-income countries will have to increase their imports as well as their exports.

Implementational Needs. Alternative strategies of growth pose different problems of implementation and therefore different personnel and institutional requirements. The emphasis in India's capital intensive strategy was on centralized determination of resource allocation, and a system of restrictive licenses and controls to prevent distribution of resources to uses perceived as undesirable. But weaknesses have been apparent in the detailed technical information necessary to guide controls to best advantage, and in the technically competent personnel to operate the rapidly expanding assignments of large-scale industry.

The employment-oriented strategy will obviously demand even more trained personnel, and most important, the administrative structure will be much more decentralized. Agricultural development itself, because of the high degree of irregularity in the conditions of production, must be a considerably decentralized process. In addition, because of small-scale production and rapid growth in needs, agriculture requires an intricate set of public institutions to support its growth. Likewise, the development of consumer goods industries and small-scale enterprises is likely to prosper more under decentralized decision-making processes and a wide range of credit, transport, technical, and other facilitative institutions. This is because such industries operate under acutely variable production conditions, rapidly changing supply and demand situations, and a reduced ability to provide their own service needs as compared to large-scale capital intensive industries. Similarly, if export is to increase successfully, entrepreneurs must be free to take ready advantage of rapidly changing production and demand potentials.

Impediments to a Change in Strategy. In India, as in so many countries, the economic basis for an employment-oriented strategy of growth is more favorable now than in the 1950s. The potentials in agriculture and the means of reaching those potentials are larger. The industrial base has greatly broadened, increasing the domestic multiplier effects of rising rural incomes as well as providing a wider range of goods for export expansion. Perhaps most important, the public and private infrastructure of institutions and trained manpower has greatly increased. On the other hand, the past ten years of near stagnation of the economy - with droughts and the decline of foreign aid - had clearly created morale and even resource problems that were much more severe in 1975 than in 1965. The droughts of 1972/73 and 1973/74 were particularly debilitating. Optimism that the old strategy would provide high growth rates has diminished, but there remain uncertainties with respect to the feasibility of the new strategy.

In general, the employment-oriented growth plan fails if major technological change in agriculture does not provide significant acceleration in production. Even though the means of achieving agrotechnical innovations are better understood now than a decade ago, and there have already been major breakthroughs in particular regions, for India and most of

the developing world acceleration in the overall growth rate in agriculture has still been modest at best. Similarly, there is likely to be a lag in promised export rise behind the immediately required import growth, with a consequent short-run increase in the trade deficit. Both alternatives - accumulated foreign borrowing and declining foreign exchange reserves - offer major political and economic risks. There is a related concern as to whether the trade policies of high-income countries will facilitate the necessary export expansion if the bulk of low-income nations become structured to produce relatively labor intensive exports. There may also be concern as to whether the necessary supportive structures, such as credit and communications, can be sufficiently developed to provide for rapid increases in employment in small-scale consumer-oriented industries and in agriculture.

But it seems more likely that political factors, rather than these economic uncertainties, will retard a change in strategy. The problems and concerns with international power remain - and in the short run continue to be less effectively dealt with by the new strategy than by the old. As with development generally, so for national defense: the faster overall growth rates associated with the employment-oriented approach may offer potential for a larger heavy industry complex in the long run - but Keynes' dictum that in the long run we are all dead may in these circumstances apply to nations, or at least to their rulers. The old arguments for domestic political integration that supported the centralization of resources and political control are less pressing now than in the first decade of independence. But meanwhile, application of the strategy that grew from those needs has now created its own set of vested interests. Farmers with large holdings have learned how to control the allocation of scarce supplies of fertilizer and other inputs, as have their counterparts in industry, while politicians and bureaucrats enjoy the power and income which arises from continued scarcity of these elements. More difficult to gauge, urban intellectuals of the political left tend to see their interests more in the old strategy of direct state control over allocation of resources than in the new approach, with its greater emphasis on the market. Defense of the old strategy by the left rises in part from an unrealistic view of the extent to which direct controls can be an effective tool to alleviate poverty, in part from hope that radical redistribution of assets and income is indeed possible, and perhaps in part from desire to maintain power and influence on the central planning mechanisms. The dilemma for the left may increase as the new model tends to increase incomes of the small- and medium-scale businessmen and large-scale farmers, as well as ameliorating the lot of the poor. Opposition to an improved position for businessmen and farmers could overbalance concern for improvement of the poor. In sum, the adjustment process in moving from one type of plan to another must not be underestimated.

The Agricultural Sector

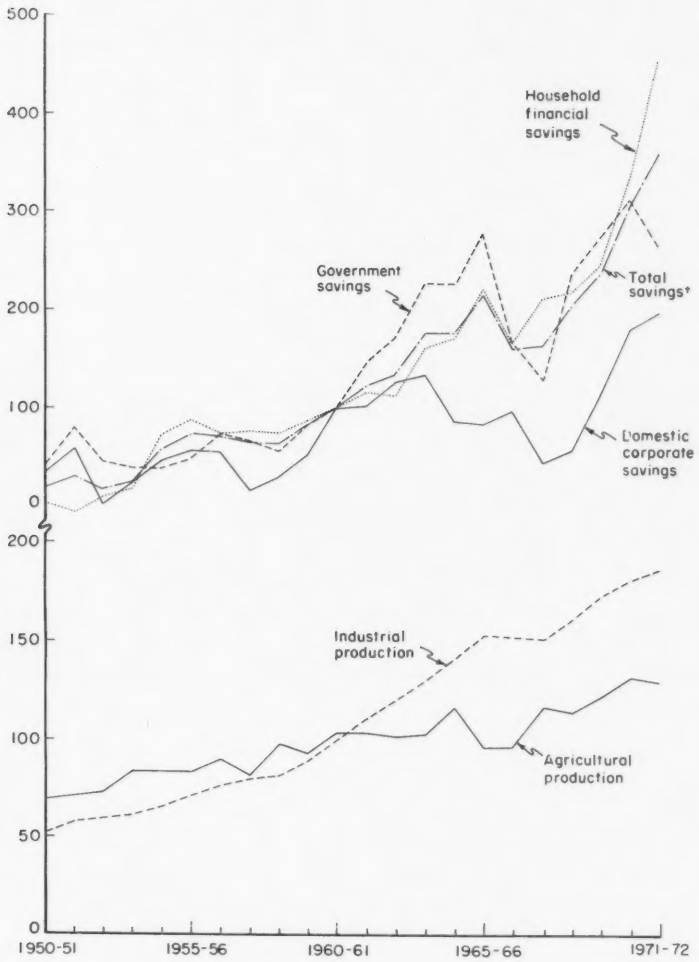
Agriculture dominates the economic change in essentially all low-income nations. In India it accounts directly for nearly half of the national product and provides a major portion of both raw materials and markets for the industrial sector. Agriculture will dominate an employment-oriented strategy of development because it contains over two-thirds of the labor force, including the bulk of the reserve army of low-productivity labor; it produces the principal consumer goods needed to sustain rapid increase in incomes of the newly employed; and it can provide a major net stimulus to demand for the output of other sectors.

In 1970/71, after two decades of major emphasis on rapid growth in the industrial sector, agriculture was still nearly four and one-half times more important than industry as a proportion of net domestic product. Since total national savings and investment are closely related to national income, agriculture-induced fluctuations in national income have a marked effect on the potential for investment in the industrial sector. This relationship was, of course, somewhat weakened in the decade from the mid-1950s to the mid-1960s by the availability of foreign aid as a major source of investment funds. Nevertheless, sharp declines in domestic savings were associated with the three major setbacks in agricultural production of the post-independence period - 1950/51, 1957/58, and 1965/66. The most dramatic cutback in savings was associated with the most dramatic decline in agriculture in 1965/66, when production fell 17 percent from the previous year and total savings in current prices declined 27.5 percent from 1965-66 to 1966-67 (Figure 1).

In each period of decline, the government, corporate, and household sectors participated in both the decrease and the subsequent sharp increase in savings associated with the slump in and recovery of agriculture. In the case of the government, it appears that a squeeze between increased wage expenditures, caused by higher food prices, and a decline in the tax base account for the drop in savings. In the household sector, savings are pressured by higher food prices and by less growth in employment. For the corporate sector, rising money wages and advancing agricultural raw material prices in the face of a downturn in production restrain both the ability and the incentives to save. It is noteworthy that in 1959, industries processing agricultural commodities still provided over 50 percent of industrial value added; for those industries, raw materials comprised over half of the total costs, with wages and salaries comprising an additional sixth of the total costs.

In 1971, the total male labor force in India was on the order of 150 million people; it was growing by approximately 3 million persons per year, and over two-thirds of that labor force was occupied in agriculture. Much of the rural labor force is exceedingly poor, only seasonally employed, and works at low productivity and low wages. Any solution to the complex problem of poverty in India must provide additional employ-

Figure 1. Indexes of agricultural production, industrial production, and savings, India, 1950-51 to 1971-72 (1960/61 = 100)*



*Base year for the indices is 1960-61, except the index of agricultural production, for which the base is 1961-62.
+Excluding household physical assets.

Sources: Savings constructed from data in Report on Currency and Finance (Bombay: Reserve Bank of India, various issues); agricultural production and industrial production, official data.

ment sufficient to absorb both increments into the labor force and a substantial proportion of the man-year equivalent of the already seasonally unemployed. While, in the long run, increased employment will have to be found largely in the non-agricultural sector, greater productive employment in the agricultural sector will provide immediate improvement in incomes of the poor. Within agriculture, the main policy focus for accelerating growth is in the production of foodgrains.

Potentials for Foodgrains. The rate of growth of foodgrain production is determined by the basic structural forces of investment in irrigation systems, biological research, the diffusion of technical innovations to farmers, and their education for using new inputs intensively. The strength of each of these forces is the product of public policy. A simple projection of past production trends is unlikely to reveal either the potentials or the reality of future growth. Achieving high levels of production will require assigning top priority to each of these functions and engaging in vigorous action.

Gunvant M. Desai has made a set of estimates consisting of crop-by-crop measures of the increase in irrigated and nonirrigated acreage, the increase in area planted to high-yield varieties, and the spread of the use of fertilizer and the rates of application. Each of these estimates is presented as a level which could be achieved under conditions of substantial government commitment to increasing agricultural production. The estimates provide a basis for judging the growth of foodgrain production, and the components of the estimates supply a means of formulating the policies and strategies necessary for realizing the potentials set forth. These estimates are of course specific to India; similar estimates must form the basis for any successful agricultural production policy in essentially all low-income nations.

The rate of growth of foodgrain production derived from Desai's assumptions is 4.9 percent per year for the period 1969/70 to 1983/84 (Table 1). That is 40 to 50 percent higher than the rate apparently attained in the first period of accelerated technological change in agriculture, 1964/65 to 1970/71, but it is less than the 5.6 percent rate targeted for the Fourth Five-Year Plan. Although each individual goal represented by a component of these estimates appears attainable, it seems optimistic to believe that all would be realized simultaneously. It will be shown [mathematical model which shows this relationship omitted] that growth rates of national income and employment are extremely sensitive to the rate of growth of foodgrain production. An increase in foodgrain output of 2.5 or 3 percent per year provides little or no stimulus to income and employment, while a rise of 3.5 percent or more results in rapid growth. The estimates used here allow for nonattainment of rates shown in the table by a margin of one quarter, and still allow scope for the new strategy of growth. Of course, even a 3.5 percent rate of growth will require much realignment of priorities.

Table 1. Estimated compound growth rates of production of various foodgrains, India, 1969/70 to 1983/84

Foodgrain	1969/70 to 1978/79	1978/79 to 1983/84	1969/70 to 1983/84
Rice	3.7	4.5	4.0
Wheat	8.1	6.8	7.6
Sorghum	5.0	4.8	4.9
Millet	5.2	5.8	5.4
Maize	8.1	7.5	7.9
Barley	0.9	0.7	0.9
Other cereals and pulses	1.4	2.1	1.6
All foodgrains	4.8	5.1	4.9

Sources: Calculated from Appendix, Table 8, and Gunvant M. Desai, Nitrogen Use and Foodgrain Production, India, 1973-74, 1978-79 and 1983-84, Department of Agricultural Economics, Occasional Paper 55, Cornell University USAID Employment and Income Distribution Project (March 1973).

Irrigation. Increasing the acreage irrigated is crucial to a rapid growth in foodgrain output. The estimates of future potentials seem reasonable in terms both of irrigable area and past rates of gain. If the potentials are to be realized, massive investment will be required, together with a sense of priority that was not evident in the early 1970s. Government of India estimates indicate that only 44 percent of the nation's total potential for irrigation had been developed as of 1968/69. Almost half of the potential remaining is estimated to result from ground water, and from small-scale surface sources of water. Expansion of both is quite compatible with the employment-oriented strategy of growth; both use labor intensive construction and local materials.

The 2.4 percent annual growth rate assumed in these calculations for the area irrigated is that actually achieved in the period 1960/61 to 1967/68, which was one of particularly rapid development. Growth at that pace could continue for well over three decades before the presently estimated potential would be fully utilized.

High-Yield Varieties. Complementary to irrigation and equally crucial to the future sharp growth in foodgrain production is the increasingly widespread utilization of high-yield crop varieties. The estimates of potential require rapid progress in using such seeds for enlarging the output of rice and the various dryland crops, and for continued progress with wheat. That will entail priority attention to the presently developing experimental system, including rapid expansion of trained manpower and adequate individual and institutional incentives to encourage quality research.

The most pressing research task is to evolve high-yield varieties of rice. Assuming that new strains will be developed to induce 80 percent and 100 percent coverage of the expanded irrigated acreage by 1978/79 and 1983/84 respectively, and given the premises for the other crops, 47 percent of the total increase in production of foodgrains by 1983/84 is expected to come from high-yield varieties of rice; and over two-thirds of this increase will be on irrigated land. The research task for the unirrigated areas is also difficult. But extensive parts of these regions have assured rainfall; given the current research emphasis on problems of dry farming, it is likely that improved crop strains will be developed for many of them in the 1970s. The estimated potentials assume that one-third to one-half the unirrigated areas will be covered by high-yield varieties by 1983/84.

Fertilizer. Increased use of fertilizer is not only complementary to the development and spread of the new high-yield varieties, but it has a potential also for expanded application to existing crop types. The acute worldwide shortage of fertilizer of the mid-1970s worsened the prospects for the new strategy until the effects of massive further investment to increase the world's fertilizer capacity could be felt. Rapid expansion in the use of fertilizer requires its spread to areas of currently low consumption, and a large increase in the intensity of application where it is already used. Three circumstances have impeded extending the use of fertilizer to the unirrigated areas. First, the amount of fertilizer it pays to use on unirrigated land tends to be low, particularly on traditional varieties. Second, large portions of the unirrigated areas lie in the two-thirds of India's districts which used only 20 percent of all fertilizer consumed in 1968/69, and where the distribution networks are poorly developed. Finally, in the frequent periods in which there is a scarcity of fertilizer, little public incentive exists to market it in areas of poor distribution facilities and high cost.

The estimate of potentials is based largely on farm survey data of profitable levels of use, which implicitly include substantial discounts for risk and are, therefore, realistic measurements. The average annual increment in the level of nitrogen use is calculated to be about 273,000 tons between 1969/70 and 1978/79, and about 467,000 tons between 1978/79 and 1983/84. These huge increases in fertilizer consumption, much greater than any ever achieved in the past, will of course occur only if the underlying assumptions about research, irrigation, and marketing prove to be correct because of a vigorous public policy. The increase in the rate of fertilizer application for the local foodgrain varieties depends on a successful farmer-education effort and a vigorous selling and marketing program. The increase in rates of application on high-yield foodgrain varieties depends, additionally, on developing more fertilizer-responsive strains, particularly for the rain-fed rice regions.

Education. The preceding analysis [of which only summary results

are presented here] confirms that, in the Indian context of the mid-1970s, the priorities are: (1) to expand the capacity to carry on agricultural research; (2) to increase the area under well-controlled irrigation; (3) to increase the supplies of fertilizer; and (4) to extend participation in new technologies to poorer regions and smaller farms. Each of these priorities requires a major expansion in the number of trained agricultural specialists of various kinds. All aspects of agricultural growth through technological change are based on expanding the number of rural supporting institutions to benefit the small farmer, who is a crucial part of the overall high-growth strategy. Because of the agricultural sector's massive size, the intensity of use of trained manpower, and stress on broad participation in growth, an emphasis on rural development requires a huge expansion of education at all levels. It is important that the rates of growth of demand for educated persons not be underestimated by basing them on the demand that existed under the capital-intensive program of the recent past, or because of excessive aversion to increasing the length of time it takes graduates to find a job as increasing numbers force the educated to take lower-level jobs. Even under past programs the rate of return to expenditure on education has been high.

This strategy of simultaneous investment in irrigation, in agricultural research, in fertilizer, and in education offers a possibility of an annual rate of growth in foodgrain production as high as 4.9 percent up to 1983/84. For each of these components of rapid growth there is a history which corroborates the feasibility of the rate of increase specified. Even if discounted for lower levels of efficiency of resource use, the record would still allow a growth rate of 3.9 percent to be reached. It is essential, however, because of their complementarity, that success be achieved in each of the parts. The experience of the early 1970s suggests that these goals can be realized but only if government focuses on irrigation investment, fertilizer supplies, and research establishments in a manner which consistently assigns them priority over all other concerns, at least until the levels of development and success delineated here are reached.

Rural Growth Linkages

Poor performance in agriculture is widely cited as a retardant to economic growth, but the potentially stimulating role of the rural sector is rarely recognized. While traditional agriculture may well be a sector of diminishing returns and increasing costs, the conclusion that increased agricultural production must inevitably become a net drain on the productivity of other sectors ignores the potentials and implications of a rapid modernization of agriculture through technological change.

Lack of capital is normally seen to be the basic restraint to growth. This view finds increased consumption in conflict with development, and incapable of providing positive multiplier effects. The demand

which agriculture furnishes for consumption goods is not usually regarded as a positive force because it is believed to divert resources from the production of capital goods to the production of consumption goods. This is not unrealistic in the context of a technologically stagnant farm economy, in which increases in output occur through higher relative agricultural prices which simply transfer purchasing power from one sector to another with an associated decline in productivity. But the increased efficiency of technologically advanced farming allows a large net increase in national income, which provides the dynamics of growth led by the agricultural sector. Thus, for India, a rate of growth of foodgrain output of 5 percent would currently provide an annual increment to national output of about Rs. 3,750 million, or 500 million dollars. It may be said -- as a rough approximation -- that for India a technologically induced addition of only one percentage point to the growth rate for foodgrain production provides a stimulus greater than the average annual increase of foreign aid during its period of most rapid expansion.

It is common to think of the pattern of demand as fixed, or as malleable only as a welfare measure. The contrasting view here is of demand as manipulable for production purposes: to reduce capital and other bottlenecks to expansion, to raise the productive use of land, and concurrently to obtain a sufficient increase in the consumption of foodgrains to sustain the agricultural production revolution.

The Changing Structure of Demand. Effective planning, both to meet increased demand and to prescribe correctives for incipient imbalances between the production and consumption of various goods, requires knowledge of patterns of expenditure from additional incomes. To the extent that the new agricultural technologies are highly profitable, only a small proportion of increased income is allocated to the purchase of capital goods for agricultural production in the longer run; a large proportion is available for consumption or for investment in the output of other goods. In the short run, however, with rapid diffusion of innovations, total expenditure on capital goods for increased agricultural production may be substantial. Current expenditure on fertilizer and other production inputs is generally much more important than fixed investment, although that relationship will vary with the nature of the technology and the environment within which it is applied. The size of increments to fixed investment may fluctuate considerably over time.

Purchased producers' goods may themselves be capital and import intensive and therefore have only weak employment multiplier effects on the domestic economy. Fertilizer, for example, has basically poor domestic multiplier effects, particularly on employment. Fertilizer, and chemical inputs in general, are either imported and consequently have little domestic growth linkage, or are produced at home with highly capital intensive production techniques. The capital equipment for chemical fertilizer and pesticide production is likely to be largely imported, and the low employment content allows little increase

for domestically produced consumer goods.

In contrast, increased expenditure on intermediate- and long-term capital goods for agriculture may have strong domestic growth linkages. In India, such investments are largely for irrigation works and labor-saving machinery, including engines and pumps for lifting water, mechanical thrashers, and a wide range of farm implements. Many of these mechanical items could be produced in small-scale rural enterprises with low capital-labor ratios. Demand for such capital goods may be highly volatile. The rapid growth and subsequent decline of the diesel engine and pump industry in Gujarat illustrate the problems of such uneven expansion. Accordingly, for the potential to be fully realized, public policy should facilitate using this industry as an entry point for a wider range of metal-working industry products.

In the long run, the purchase of consumer goods absorbs most of the increased rural incomes. The nature of the new foodgrain technologies, along with the availability of resources, determines the distribution of the additional income. Data about those determinants indicate that on the order of 60 to 80 percent might be expected to be expended on consumer goods. The consumption expenditures on foodgrains, other agricultural commodities, and nonagricultural commodities, each differ in their demand and in their production characteristics and hence are analyzed separately.

Demand for Foodgrains. Agricultural laborers in India, represented mainly by landless workers (the bottom two deciles of rural expenditure classes), spend over three-quarters of increments to consumption on agricultural commodities, and 59 percent on foodgrains alone (Table 2). Therefore, increasing foodgrain production through labor-using methods is substantially a self-balancing process. More labor is employed in foodgrain production; much of the increased output is paid to the laborers who will directly consume a substantial proportion of the payments; and there is small effect on cash flows or stimulus to other sectors of the economy. In contrast, agricultural technology which distributes benefits to higher-income rural people provides much more complex linkages.

In successively higher expenditure classes, the proportion of increments to expenditure spent on foodgrains declines rapidly. For the sixth, seventh, and eighth deciles (representative of medium-sized farmers with 5-10 acres producing a major portion of the national agricultural output), only 16 percent is allocated to foodgrains. Thus, these income groups market foodgrains to the equivalent of about 84 percent of the value of increments to expenditure. These marketings provide the food supplies to sustain an increase in the labor force in the nonfoodgrain sectors; these sales supply the cash incomes to purchase the goods and services which the added labor can produce. The nature of the various equilibria and of the resultant policy needs is

determined by the composition of the remaining consumption allocation.

Demand for Nonfoodgrain Agricultural Commodities. Nonfoodgrain agricultural commodities as a broad class comprise roughly 35 percent of incremental expenditure in all income classes except the lowest. Even in the sixth, seventh, and eighth deciles, these commodities are two-thirds as important as the total for nonagricultural goods. Consequently the linkage effects of increased rural incomes are particularly strong with the nonfoodgrain sectors of agriculture itself. This important point -- rarely recognized in the growth literature -- has critical significance for public policy because of the urgent need of this small-scale sector for supporting institutions and facilities. This sector is of even greater importance in the many countries of Asia, Africa, and Latin America with a higher average per capita income than India's. Thus the common neglect of this subsector of agriculture is even more unfortunate in those other countries.

In India, milk and milk products are the most important of the nonfoodgrain agricultural commodities. They take roughly 12 percent of incremental expenditure in all but the highest- and lowest-income classes. For the upper middle expenditure group (sixth, seventh, and eighth deciles), milk products are nearly twice as important as cotton textiles, a third more important than all textiles, and over six times as important as consumer durables. In other low-income countries where less milk is produced other livestock products, such as poultry or pork, may have similar production characteristics to dairy products.

Demand for Nonagricultural Commodities. In India only 21 percent of incremental expenditure is allocated to nonagricultural commodities in the lowest two income deciles, while 48 percent is so distributed in an average of the sixth, seventh, and eighth deciles (Table 2). Textiles comprise the largest single component of expenditure on nonagricultural commodities and remain relatively constant in proportion to incremental expenditure. However, as family expenditure increases, the proportion spent on cotton textiles declines relative to woolens and synthetics.

The share allocated to consumer durables and semidurables is low in all income classes, but does show a large percentage increase as total expenditure rises. Incremental spending on these items may be significantly understated because the period to which the data refer was one in which such goods were not widely available. Additional expenditure on consumer services and education rises sharply with increased income, and attains major importance in the higher deciles. These two categories are comprised largely of labor with various levels of training and offer an excellent opportunity for public policy to be influential on employment, particularly by enlarging the education system and reducing costs. (The considerable size of the miscellaneous group dramatizes the paucity of expenditure data on nonagricultural commodities.)

Table 2. Division of incremental expenditure among expenditure categories, by rural expenditure class, India, 1964-65

Decile: (rough correspondence to agricultural holdings of:)	Bottom two (landless)	Third (under 1 acre)	Fourth & fifth (1–5 acres)	Sixth, seventh, & eighth (5–10 acres)	Ninth (10–15 acres)	Lower one-half of tenth (15–30 acres)	Upper one-half of tenth (30+ acres)
Mean per capita monthly expenditure (Rs.)	8.93	13.14	17.80	24.13	30.71	41.89	85.84
Allocation of an additional rupee of expenditure							
Agricultural commodities	0.79	0.69	0.59	0.52	0.46	0.40	0.33
Foodgrains	0.59	0.38	0.25	0.16	0.11	0.06	0.02
Nonfoodgrains	0.20	0.31	0.34	0.36	0.35	0.34	0.31
Milk & milk products	0.07	0.11	0.12	0.13	0.13	0.12	0.09
Meat, eggs & fish	0.02	0.03	0.03	0.03	0.03	0.03	0.02
Other foods	0.01	0.05	0.07	0.09	0.10	0.12	0.16
Tobacco	0.01	0.01	0.01	0.01	0.01	0.01	0.01
Vanaspati	–	0.01	0.02	0.02	0.02	0.02	0.01
Other oils	0.05	0.05	0.04	0.04	0.03	0.02	0.01
Sweeteners	0.04	0.05	0.05	0.04	0.03	0.02	0.01
Nonagricultural commodities	0.21	0.31	0.41	0.48	0.54	0.60	0.67
Textiles	0.09	0.08	0.07	0.06	0.07	0.06	0.07
Cotton textiles	0.09	0.08	0.07	0.06	0.06	0.05	0.03
Woolen textiles	–	–	–	0.01	0.01	0.01	0.02
Other textiles	–	–	–	0.01	–	–	0.02
Nontextiles	0.12	0.23	0.34	0.40	0.47	0.54	0.60
Footwear	–	0.01	0.01	0.01	0.01	0.01	0.01
Durables & semi-durables	0.01	0.01	0.01	0.02	0.02	0.03	0.05
Conveyance	0.01	0.01	0.02	0.02	0.03	0.05	0.10
Consumer services	0.02	0.02	0.02	0.03	0.03	0.04	0.06
Education	0.01	0.01	0.02	0.03	0.03	0.05	0.11
Fuel & light	0.07	0.07	0.06	0.05	0.05	0.04	0.03
House rent	–	0.01	0.01	0.02	0.03	0.04	0.08
Miscellaneous	–	0.09	0.16	0.22	0.27	0.28	0.16
Total	1.00	1.00	1.00	1.00	1.00	1.00	1.00

Sources: The table is from John W. Mellor and Uma J. Lele, "Growth Linkages of the New Foodgrain Technologies, Indian Journal of Agricultural Economics, 28:1 (January-March 1973), 35-55. The data are reported in B. M. Desai, "Analysis of Consumption Expenditure Patterns in India," Occasional Paper No. 54, Department of Agricultural Economics, Cornell University-USAID Employment and Income Distribution Research Project, August 1972. The source for the data is National Council of Applied Research, All-India Consumer Expenditure Survey, 1964-65, Vol. II (New Delhi, 1967).

Rural-Urban Contrasts in Demand. Sharp contrasts between rural and urban people (Table 3) suggest a dissimilarity in short-run development patterns between the sectors and, for the rural segment, a potential for sharp changes in the future. The expenditure elasticity for foodgrains is higher in all deciles in the rural areas. Most notably, the elasticity drops much less in conjunction with rising expenditure in the rural than in the urban areas. Expenditure elasticities for milk and milk products are also consistently somewhat greater in rural than in urban areas. For clothing, they are smaller in the low-expenditure groups, then fall much less rapidly, and end up higher in the upper-expenditure groups.

Hanumantha Rao shows that foodgrains may be as much as 19 percent cheaper and urban goods 34 percent more expensive in rural than in urban areas. Apparent elasticities may change substantially as rural markets are more fully integrated into the national centers. Consumer tastes may also alter over time, especially in the dynamic context of rapid increase in income, enlargement and integration of markets, and change in income distribution. Furthermore, Simon found a strong tendency for lower-income members of a particular socioeconomic group to emulate several aspects of consumption of higher-income members of the same group, with resultant contrasts among different social classes within the same income group. Past consumer survey data are an important source of information, but can be no more than broadly indicative of changes in consumption.

The complexities of predicting expenditure patterns and the consequent adjustments of production afford a substantial and multifaceted opportunity for public policy. In a rural-oriented growth strategy, the rewards of a highly pragmatic and flexible planning program are much greater than in the capital intensive approach.

Table 3. Comparison of rural and urban expenditure elasticities for three commodity groups, by expenditure class, India, 1963-64.

Per capita monthly expenditure class * (rupees)	Rural			Urban		
	Foodgrains	Milk and milk products	Clothing	Foodgrains	Milk and milk products	Clothing
Lower expenditure						
0–8	1.2	3.4	2.8	1.2	2.8	5.6
8–11	0.9	2.7	2.4	0.8	2.2	4.1
11–13	0.8	2.3	2.2	0.7	1.9	3.5
13–15	0.7	2.1	2.1	0.6	1.8	3.1
Lower middle expenditure						
15–18	0.6	1.9	2.0	0.5	1.6	2.8
18–21	0.6	1.8	2.0	0.4	1.5	2.5
Upper middle expenditure						
21–24	0.5	1.7	1.9	0.3	1.4	2.2
24–28	0.5	1.6	1.9	0.3	1.3	2.0
High expenditure						
28–34	0.5	1.4	1.8	0.2	1.3	1.9
34–43	0.4	1.3	1.7	0.2	1.2	1.7
43–55	0.4	1.2	1.7	0.1	1.1	1.5
55–75	0.4	1.2	1.7	0.1	1.1	1.3
75 & above	0.3	1.0	1.6	0.1	1.0	1.1
Mean elasticity	0.5	1.6	1.9	0.2	1.2	1.8

* The expenditure classes refer to the following deciles: Lower expenditure to bottom three deciles, lower middle expenditure to fourth and fifth deciles, upper middle expenditure to sixth, seventh, and eighth deciles, high expenditure to top two deciles.

Source: John W. Mellor and Uma J. Lele, "Growth Linkages of the New Foodgrain Technologies," *Indian Journal of Agricultural Economics*, 27:1 (January–March 1973), 35–55, Table IV.

The Effect of Alternative Distributions of Income on Demand Structure. The profound differences in consumer demand and linkage

effects deriving from alternative income distributions may be summarized for two different examples related to differing agricultural technologies. In each case, a total sum of Rs. 2,400 million is allocated among consumption expenditure categories. (Rs. 2,400 million is approximately equal to the value of a 4 percent increment to foodgrain production, minus about 20 percent of the gross income for production expenditures.) In one case, characteristic of many of the new high-yield foodgrain varieties, 10 percent of the Rs. 2,400 million is expended by the laboring classes (the lower three deciles in expenditure patterns), and 90 percent is spent by the dominant owner-cultivator class (the sixth, seventh, and eighth deciles). In the alternative case, 80 percent of the income is expended by the laboring classes and 20 percent by the owner-cultivator class. The latter division is analogous to the division of expenditure in the case of traditional, labor intensive increases in agricultural production.

In the first case, only about 19 percent of the added expenditure is allocated to foodgrains and therefore remains in the foodgrains sector. In the second case, 39 percent is consumed as foodgrains. The composition of the increment in demand for nonfoodgrain agricultural commodities also shifts with the distribution of income. For milk and milk products, it is about 20 percent greater in the distribution that favors the upper-income groups. The increment in demand for other foods, including fruits and vegetables, is 50 percent greater in the distribution toward the landowning classes than for that toward the laboring classes. In contrast, among the laboring classes, the additional consumption is relatively larger for edible oils and sweeteners. Striking differences occur in demand for nonagricultural commodities. While the increment in demand for cotton textiles actually is 16 percent less in the distribution toward the rich, as compared to the distribution toward the poor, the increment in demand for most other manufactured goods and urban-supplied services is clearly larger in the "rich" case. The increase in consumption of miscellaneous goods, largely consumer nondurables, is twice as great for the rich as compared to the poor. These are, of course, the consumption patterns that would occur if the underlying demand functions did not change, and if adequate planning allowed the desired quantities to be produced and supplied without relative price changes.

Policies to Influence Consumption Patterns. It should be apparent that expenditure patterns for the additional income generated by technological change in foodgrain production do not necessarily create sufficient domestic employment to meet the society's income distribution objectives, or sufficient derived demand for foodgrains to maintain relative prices at a level to sustain the incentive for increasing foodgrain production. To shift the structure of domestic production toward greater employment, taxes and subsidies may be used to channel consumption toward more labor intensive commodities; change in trade

patterns may allow a relative expansion of industries with a comparatively high labor content; taxation of the well-to-do rural population may provide revenues for expenditure on labor intensive public works projects.

Correct policy choice rests on knowing how much increased employment can be supported by food supplies, the employment content of alternative production structures, and the effect of various policies on both demand and production. Because of its size, the agricultural sector itself offers particular opportunity for a net increase in employment through change in the pattern of consumption and production. Similarly, rural public works provide a promising potential for expanding the employment content of expenditure. All public programs intended to increase employment should focus on the net increase prerequisites, such as wage goods and administrative talent, and consider the alternative combinations. For example, directing public works programs requires administrative resources which might also be used to increase foodgrain production to relax the wage goods constraint. Likewise, the levying of taxes to pay for public works projects may reduce expenditure on labor intensive consumer goods and services. Deriving policy to maximize employment is thus an economic exercise in optimal allocation of the various resources requisite to increased employment.

Those rural public works projects should be emphasized which contribute to increased foodgrain production, thereby further relaxing the wage goods constraint, rather than schemes with a possibly higher short-run employment content but less agricultural productivity. Closely connected is the question of the extent to which the works created contribute to a growing number of jobs -- as, for example, through the increased labor intensity of farming associated with irrigation provided by public works -- or simply provide employment in the projects themselves. These issues may relate to an important element of regional development, an aspect illustrated and explored by Donovan in the context of alternative uses of resources in irrigated and dry areas of Kanartaka state. According to his study, the irrigated area is already provided with a well-developed infrastructure of roads, electricity, and irrigation canals. In that environment, investment in credit programs to support a considerable intensification of agriculture yields as much -- or more -- additional employment as the same sum spent on rural works in a nearby dryland area. In addition, the heightened investment in the irrigated area yields much more aggregate income because the area is on the threshold of being able to support the use of high-performance agricultural activities. A dilemma may then emerge: whether to invest in the regions already somewhat advanced technologically, with the expectation that dryland regions will become servicing areas for irrigated agriculture via labor migration; or whether to invest directly in employment-creating pro-

grams in dryland regions, even though their prospects for further advances may be small. The former alternative raises the tax base and may appear more desirable on grounds of increased production; the latter preserves existing communities and may be required on social and political grounds.

The answers to the questions of where, when, and how much to spend on rural public works projects may become most relevant in the context of a broad, employment-oriented strategy of development, particularly if foodgrain production is increasing faster than employment. Thus, rural public works may occasionally, as in the case of small irrigation projects and sometimes roads, provide the basis for an increased supply of the wage goods needed to support the greater number of jobholders. But they may also distribute income toward small target groups in the context of a low-employment strategy of growth. Unfortunately, rural public works schemes are all too often regarded solely as sources of employment, without the necessary concern for the resources they use up and the supply of those resources. In such cases, they may easily result in a net decline in employment.

Expanding Nonfoodgrain Production in Response to Increased Demand. The linkages arising from increased foodgrain production cannot have their full stimulative effect on growth unless restraints on expanded production in the domestic consumer goods sector are removed. The nonfoodgrain agriculture sector is the most important recipient of increased demand resulting from rising incomes and is, in many respects, the most attractive for expansion because of its labor intensity and the wide geographic dispersion of its pattern of demand and production. In recent decades, supply has, in general, lagged somewhat behind demand in this sector, primarily because of the lack of a broad infrastructure of rural development.

In India, dairy production epitomizes the opportunities and the development needs of the labor intensive nonfoodgrain area. In 1968/69, milk and milk product production, estimated in terms of rupee value, was nearly one-quarter as great as foodgrain production, and all but the lowest-income class spent 50 percent more of increments to income on milk and milk products than they did on textiles. The incremental demand for dairy products over the next ten years could well support an additional 4.5 million full-time jobs. But the relatively poor supply response of milk to even the slow growth in demand in the 1950s and 1960s underlines the difficulty of realizing these substantial potentials. During that period, prices of dairy products consistently rose faster than foodgrain prices. Presumably, the supply ineslasticity would be even more binding in the context of greatly accelerated expansion.

Milk production must cope with at least three restraints to growth.

Most important is marketing. Highly perishable dairy products present technical problems of distribution, particularly if they are to be produced mainly on small farms. Second is the matter of credit. Dairy animals are expensive and, equally important, animal mortality imposes a heavy financial burden on small farmers. As a result, credit institutions need to be molded to these special risk factors and to the problem of intermediate-term credit. Third, the research and extension infrastructure for milk farming is particularly weak. Expansion of production can be stimulated in part by higher relative prices financed by the advance in foodgrain technology, and in part by cost-reducing technological improvements. Both the research and the educational establishments for these purposes are less developed than for foodgrains, although a basis for meeting these needs can be provided by the current Dairy Development Schemes.

Vegetable production is also a labor intensive system with a similar set of institutional requirements. As a matter of fact, any labor intensive and demand-elastic agricultural product faces problems of expanding marketing facilities, large credit requirements, substantial risk and uncertainty, and poorly developed research and education facilities. And each product requires separate diagnosis of its specific problems and the development of programs to overcome them.

Although institutional development is the key to labor intensive growth within a rural-led strategy of expansion, capital is also significant. Increased foodgrain production not only relaxes the wage goods constraint, enlarging the potential need for capital in expanding employment, but may itself require substantial additional investment. The capital constraint may be eased by the foodgrain technological advances themselves, if either the resultant increase in demand is for commodities with relatively low capital-labor ratios (thereby reducing resources requirements per worker), or if the consequent structure of income, demand, and production stimulates a higher rate of capital formation.

The past planning emphasis on capital goods industries has yielded a poor quality and quantity of data on consumer goods industries. Nevertheless, the statistics do suggest that the capital used per employee is comparatively less in the consumer goods industries experiencing the largest rise in demand resulting from increased rural incomes. It also appears that, while capital intensity within these industries varies considerably, industries with relatively high capital-labor ratios are primarily those catering more to demand from high-income urban consumers (Table 4).

The capital-labor ratio for urban milk processing, however, is high and is comparable to that of the chemical industry. The ratios for the cotton textile and the cigarette industries are lower than for milk and milk products, but much above that for several other major consumer

Table 4. Capital-labor ratios and value added for various consumer goods industries, India, 1960 to 1964

Consumer goods industry	Productive capital per employer	Plant machinery and tools per employee	Percent of all industrial value added	
			1960	1964
Milk foods & malt foods	26,446	12,949	0.1	0.1
Other foods				
Processed fish & seafood	6,498	4,249	–	–
Processed fruits & vegetables	5,871	1,678	–	0.1
Tobacco				
Biri	816	33	0.2	0.0
Cigarette	17,798	2,056	1.2	1.2
Snuff	10,754	1,267	–	–
Jerda	3,658	476	0.1	–
Other Tobacco	1,653	135	(not comparable)	
Edible oils	7,635	2,380	0.6	0.4
Other oils				
Vanaspati	14,010	4,299	0.9	0.4
Sweeteners				
Sugar	12,107	6,113	4.4	3.0
Gur	1,961	976	–	–
Cotton textiles	4,843	2,382	23.7	17.7
Other textiles				
Wool	9,259	2,729	0.7	0.8
Art silk	11,427	5,274	1.3	2.2
Footwear	4,821	610	–	0.1

Source: John W. Mellor and Uma J. Lele, "Growth Linkages of the New Foodgrain Technologies," Indian Journal of Agricultural Economics, 28:1 (January-March 1973), 35-55, Table VII.

goods industries, for example, the traditional types of tobacco products. Under small-town and rural conditions, tobacco products or their close substitutes are consumed in a form requiring much less capital intensity in their production. Thus, if the structure of demand does not change drastically to conform to high-income urban consumption patterns, it may influence the choice of techniques as well as the scale of production of many of these goods. By means of both these factors, the demand structure associated with rising rural incomes can encourage a more decentralized and labor-using pattern of industrialization. To achieve that pattern may, however, require considerable investment in the rural infrastructure.

From 1961 to 1965, the industries which experience a sharp rise in demand resulting from increased rural incomes actually showed a relative decline in importance. Noteworthy large decreases occurred in the low-capital intensive consumer goods industries. Major increases in rural income may help to reverse this tendency, and to change the structure of growth of demand and output toward more labor intensive industries. At the same time other elements of the process offer a potential for greatly increased saving and investment.

Additional rural savings may not only finance much of agriculture's larger capital needs, but may also partially finance expansion of the nonagricultural sector. The extent to which agriculture supports investment in other sectors depends on (1) the net capital requirements for agriculture's own increase; (2) the development of institutions for transferring savings within agriculture itself as well as for moving them to other sectors; (3) the returns to capital in other sectors; and (4) the form of institutional growth in other sectors of the economy.

Inter-sectoral Resource Flows. A rural-led strategy of development is likely to produce: high average rates of returns to investment in agriculture; rapid growth of small-scale rural industry receiving direct capital from cultivators; price relationships for industrial consumer goods which facilitate high profits and reinvestment; and an income base in agriculture sufficient to support taxes to self-finance much of the infrastructure requirements. The resulting substantial net outflow of resources from agriculture will spur growth in other sectors of the economy even while agriculture itself is expanding rapidly and profitably.

Since these relations are difficult to grasp and widely disputed, it is useful to summarize the experience of Taiwan as a nation which followed such a pattern vigorously and successfully over a substantial period of time and under varying conditions of rural development. Two elements of that experience are particularly relevant. First, continuously from 1895 to 1960, through several major periods of agricultural expansion, there were large net resource transfers out of agriculture. Second, several quite different devices were used for such transfers, each appropriate to the economic and political conditions of the respective periods.

The period from 1911 to 1920 witnessed rapid growth in irrigation projects but, in other technological respects, was stagnant. In that decade, the net resource transfer from the agricultural sector was equal to over half the value of its sales and 30 percent of the value of its production. In the technologically dynamic period of the 1920s, when the new Ponlai rice varieties were introduced and fertilizer use was accelerating, purchases of nonagricultural commodities by the agricultural sector more than doubled. Nevertheless, the net outflow of resources rose and was maintained at a high level: its value as a percentage of production and sales declined from the earlier period, but increased production allowed larger absolute totals. At the same time, agriculture was making greater use of industrially produced capital and consumer goods.

In the 1950 to 1955 period of extraordinary rapid population growth, economic development, and technological change in agriculture, the net real resource transfer from agriculture hit a new high. In this period, such transfer recovered to nearly 40 percent of agricultural

sales and over 20 percent of total agricultural production. It was only in the next period, 1956 to 1960, after the economic transformation to a substantially industrial economy had been largely completed, that the net transfer began to decrease slightly in real, absolute terms to equal only 15 percent of production and 25 percent of sales of agricultural products. The decline in transfers from agriculture continued after 1960. Thus, agriculture made a major contribution during the critical period in the development of a rapidly growing labor intensive industrial sector.

Just as revealing as the large net transfers from Taiwan's agriculture were the dramatically changing roles of various transfer mechanisms. In the pre-World War II period, fiscal measures and land rent payments were vital in the transfer. In the latter part of the prewar period and in the postwar period, outflow through financial institutions was also significant. In the post-World War II period, the transfer of resources was achieved primarily by a sharp turn in relative prices against the agricultural sector, so that invisible items represented over 40 percent of the transfer from 1950 to 1955. The most important mechanisms of this shift were a barter exchange of rice for fertilizer, and the compulsory purchase programs. The importance of particular methods and institutions for financing resource flows changed substantially from time to time in accordance with economic and political factors. The choice was not necessarily the most efficient according to conventional economic criteria. For example, the heavy reliance in the postwar period on what was, in effect, a tax on fertilizer presented to farmers one of the most unfavorable fertilizer-rice price ratios in the world. Nevertheless, the proceeds were used in a total context favorable to cost-reducing technological change in agricultural commodities.

In contrast to Taiwan, India has, since independence, continually transferred resources into a generally technologically stagnant agricultural sector. Government expenditures on agriculture have consistently exceeded tax revenues from agriculture. Relative prices have, with a few brief exceptions, moved in favor of the sector; credit institutions have transferred funds into it; and the nature of industrial growth has encouraged little net investment by rural people, while urban workers have made net remittances back to the agricultural sector.

The economic changes associated with rural development could alter these relationships in the future. High rates of return provided by the new technologies in irrigated areas could supply the basis for recovering investment in a few years and therefore the potential for placing money outside agriculture, for paying increased taxes, or for absorbing lower relative agricultural prices. Only 20 percent of India's cultivated acreage was irrigated in 1967/68 as compared to 41 percent

in Taiwan in 1921. To the extent that the requirements of investment in irrigation are high, it becomes even more important to a rural-led strategy of growth to restrain the capital intensity of nonagricultural advancement. Fortunately, in India, because of the great possibility of very high rates of return for small-scale irrigation, the period of large net investment by agriculture in other sectors need be only briefly delayed.

A wide variety of means is at hand for tapping the savings potential arising from a dynamic agriculture. Continued growth of a nationally integrated system of rural credit, including the credit cooperatives and rural branches of banks, is necessary to move financial resources from regions in repayment stages of the technological investment cycle to those in the net borrowing stage, as well as to make timely net transfers of resources out of agriculture. Development of the infrastructure for small-scale rural industry can encourage agricultural savings and direct investment in industry. Indeed, if political factors remove the other means of capital transfer from agriculture, the potential for direct investment by agriculturalists in industry becomes a strong argument for fostering country-based, small-scale industries as major means of extracting resources. Stimulation of small-scale industry itself requires large investment in communication and power. Thus, tapping rural sources of savings may demand a shift in the strategy of growth toward rural areas generally.

In nearly all low-income countries, rural taxation has been singularly unproductive. The economically preferred levy, the land tax, has declined to the point of insignificance as a source of revenue. Charges for water and electricity have tended to contain a subsidy element. The hope must be that in a technologically dynamic agriculture, allocation of taxes for local purposes and an increasing role for local government will reverse the past trends. As rural consumption patterns shift toward nonagricultural goods, the incidence of indirect taxes on agriculture can rise rapidly.

Sharp increases in rural incomes can, of course, raise relative prices of industrially produced consumer goods and hence provide an effective transfer of resources to consumer goods industries. The more that capital limits this growth, the greater the price increase in response to greater demand, and the higher the profits; therefore the incentive and the means to invest will be greater. The very increase in rural demand and the improvement in rural roads needed to encourage rural industry may also provide a relatively painless additional boost to the industrial sector through their effect on relative prices. High costs of transportation, the reinforcing effect of small markets, and consequently high distribution costs have resulted in rural consumption patterns in which agricultural commodities predominate over manufactured goods. High returns to investment in rural infrastructure and

the economies of scale resulting from the broadening of markets, in effect, allow changes in relative prices which act as a source of capital for growth of consumer goods produced in the industrial sector.

Agriculture's capital contribution to other sectors does not require that any particular mechanism be used for tapping agricultural income, but policy should not eliminate all possible devices. There is a genuine danger that this will happen. Strong farmers' lobbies may prevent taxes on agriculturalists from being raised, or may obtain farm price supports and subsidies on inputs. If, in addition, small-scale industry is not supported by investment in infrastructure and supply of raw materials, and if middle-class urban consumers lobby successfully to prevent a rise in prices of major industrial consumer goods, agriculture will lose all the means and sources contributing to capital formation. If lack of government revenues then prevents even the rural investment necessary for a continuation of expansion in agricultural output, there may be a return to a low-level equilibrium among scant development in agriculture, slight employment increase, moderate rise in demand for agricultural output, and reversion to a capital intensive, slow-growth industrial strategy.

It has been implicit throughout this discussion that the bulk of increased demand for consumer goods will be met by expanded domestic production. Leakages into imports, of course, reduce the employment multiplier effects. Leakages are likely to be small in India, both because the expenditure patterns are toward the relatively labor intensive kinds of goods in which India has a comparative advantage in production, and because the past industrialization effort has provided a production base of capital and entrepreneurship suitable for expansion to meet domestic demand and also for exports to pay for required capital intensive intermediate products. If ownership of land were concentrated in large holdings providing the bulk of income to families consuming predominantly capital intensive imported goods, the strategy would not succeed.

[Extracted from The New Economics of Growth, Chapters 1, 2, 3, and 7. A Twentieth Century Fund study; Copyright ©1976 Cornell University Press, Ithaca, New York.]

Note: This book taking an integrated view of development also includes chapters dealing with the rural poor, industrialization, trade, aid, and various aspects of human resource development.

A Basic Needs Strategy for Development

Report of the Director General,
International Labour Office (ILO)

[The report from which this extract came was presented by the Director General of ILO to the Tripartite World Conference on Employment, Income Distribution, Social Progress and the International Division of Labor, Geneva, June 1976. The proposal here is that a major developmental goal should be to supply minimum "basic needs" to all of a nation's population in formulating economic plans. (See also Dudley Seers' definition of development goals, Development Digest, April 1973, p. 109.)]

During the three decades since the Second World War, most governments have relied primarily on over-all economic growth backed by high investment to reduce poverty and inequality, and in the industrialized countries to avoid serious cyclical unemployment. This policy has led to rapid and sustained growth in national output and investment in both developed and developing countries. However, it has become increasingly evident, particularly from the experience of the developing countries, that rapid growth at the national level does not automatically reduce poverty and inequality or provide sufficient productive employment.

It was the awareness of this problem which inspired the ILO to launch the World Employment Program in 1969. The focus of the Program has been on employment, the implicit assumption being that the creation of additional jobs, more productive and adequately remunerated, had an important role to play in the

The ILO is a specialized agency associated with the United Nations, with headquarters in Geneva, Switzerland.

attack on world poverty and in furthering social progress. Nothing that has happened since has invalidated that assumption. It has become apparent to the ILO, however, as a result of its research, and from the practical experience it has acquired in the field and in its employment missions to various countries, than an employment-oriented strategy, by itself, will not suffice. The creation of more and better jobs is not enough; employment issues are intimately connected to wider issues of poverty and inequality, and it is in this context that they need to be examined.

The approach which is now proposed to this Conference is that development planning should include, as an explicit goal, the satisfaction of an absolute level of basic needs. This proposal goes somewhat further than the intention, already expressed by many governments, to concentrate the development measures more directly on the poorest groups of the population. The definition of a set of basic needs, together constituting a minimum standard of living, would at one and the same time assist in the identification of these groups and provide concrete targets against which to measure progress. The following describes, in a short and simplified way, the broad notion of basic needs.

The Concept

Basic needs, as understood in this report, include two elements. First, they include certain minimum requirements of a family for private consumption: adequate food, shelter and clothing are obviously included, as would be certain household equipment and furniture. Second, they include essential services provided by and for the community such as safe drinking water, sanitation, public transport, and health and educational facilities.

A basic-needs oriented policy implies the participation of the people in making the decisions which affect them. Participation interacts with the two main elements of a basic-needs strategy. For example, education and good health will facilitate participation, and participation in turn will strengthen the claim for the material basic needs. At the same time, employment enters into a basic-needs strategy both as a means and as an end. Employment yields an output. It provides an income to the employed. And it gives a person the recognition of being engaged in something worth his while.

The fulfillment of physical basic-needs targets in the poorer countries of the world certainly cannot be achieved by a redistribution of goods currently produced. Not only must the structure of production change, but the total amount produced must also rise over time. For this reason it should be stressed that a rapid rate of economic growth is an essential part of a basic-needs strategy. Part of the necessary

increase in output would come from making use of currently underemployed and unemployed labor resources and linking them with a better allocation of capital, and part through the redistribution of productive resources. Fuller employment would thus be a means of producing more goods and simultaneously of acquiring the purchasing power to gain access to them. More adequate employment would also be the first essential step towards fuller participation in society.

Improvements in the quality of employment or conditions of work should be another important objective, one that is of particular interest to the ILO. Many people's work at present is demoralizing, undignified, or dangerous to health. There is also the special aspect of the drudgery of women's work. Since most people must work in order to participate in the economy, it is desirable that they should be able to take pride in their work.

The basic-needs concept is of universal applicability, although the relative importance of its components will vary with the level of development and from one nation to another. Basic needs constitute the minimum objective of society, not the full range of desirable attributes, many of which will inevitably take longer to attain. To determine the actual levels at which basic-needs targets should be set requires much further analysis and discussion, and some value judgements. Basic needs for health and the closely related field of nutrition can be set on the basis of scientific findings, although these are still being constantly improved. In such fields as housing and education the targets are bound to be more subjective. Climatic and other differences between countries must also play a part in determining the level of basic needs. Moreover, just as there is relative poverty (relative to the levels of living of others in the same society) as well as absolute poverty, basic needs can be relative as well as absolute. In the present situation, however, it is both legitimate and prudent to concentrate first on meeting basic needs in the absolute sense.

Alternative policies. There are several ways in which the basic needs of the poor could be satisfied within a given time-horizon. One approach is through more rapid over-all growth alone, leaving the income distribution to market forces. Under this approach, which implies high rates of investment, redistribution could occur as a by-product of over-all increased output. There are at least three reasons why this approach may be questioned: first, it is doubtful whether the majority of developing countries will be able to achieve and sustain the very high rates of growth required; second, in certain countries a substantial portion of the population or entire regions have not automatically benefited from over-all rapid growth; third, the very high levels of investment required may lead, in an initial period, to maintaining, if not worsening, sub-standard levels of living that are unacceptable from a social or political point of view.

A second approach is to raise the incomes of the poverty groups faster than the average by a redistribution of income as well as growth. The growth rates required under this second approach would be less high, and therefore easier to attain than in the first approach; but there might be great difficulties, political and other, in implementing policies for redistribution. Such redistribution could be brought about through a combination of (i) changing the relative prices of the products and labor services which the poor provide compared with the prices of things they buy, (ii) introducing consumption transfers which benefit the poor, (iii) introducing investment transfers to the poor, e. g. by such measures as land reform. Unless the first three are combined both with progressive taxation and a redistribution of assets they may be ineffective. Changes in relative prices alone are unable to alter more than marginally the share of income received by the poor, and some price changes lead to secondary effects which neutralize the initial impact. Higher rural minimum wages, for example, may increase the cost and price of food consumed by the poor and thereby leave the distribution of income essentially unchanged. Both consumption and investment transfers can rarely be limited only to the poor. Subsidized education, in the absence of a severe means test, benefits virtually everyone; similarly, investment in rural roads benefits all cultivators, particularly the largest farmers who have most to sell.

Target setting. A most important attribute of any worthwhile targets is credibility. If they are set too high, their attainment is likely to be too far in the future to be either morally or politically acceptable, or even of much interest to the present society. If they are too low, they are equally unacceptable; while they are more easily and quickly attainable, people may not feel it worth striving for so small an improvement.

The level at which the basic-needs target might be established by a single country will naturally vary with the stage of development it has reached. It will also depend on the value set by the people of a country on the equality of incomes and consumption. Governments wishing to embark on a basic-needs strategy may find it useful as a first step to establish suitable machinery to determine a national set of basic-needs targets or minimum standard of living. These will generally be more elaborate than those discussed below, but this should not be carried too far. Simplicity in this case is probably an important aspect of credibility. It is certainly better to concentrate the country's planning expertise on the next stage of devising the policies and measures required to implement the basic-needs strategy than on the preparation of a highly sophisticated and detailed set of targets.

But the target-setting stage is nevertheless of crucial importance. It is essential that the people whose basic needs have to be met should participate in the determination of these needs, rather than having them

handed down from above. In many countries it will probably be found that such participation is severely hampered by the lack of organizations that can express the views and aspirations of the poorest population groups, especially those in rural areas. It may well be, therefore, that an attempt to involve the people in the setting of basic needs targets will provide a stimulus to the establishment of such organizations.

The point of departure of any development strategy oriented toward the reduction of unemployment and poverty is the initial level of income and its distribution. The desired path of development subsequently followed by the economy then depends upon (i) the target level of income that is set, (ii) the time-period in which it is proposed to achieve the target, (iii) the extent to which it is possible to redistribute income and wealth, whether initially or over time, (iv) the speed at which output increases and (v) the rate of growth of the population. Numerous permutations of these elements are possible, and by examining them interesting perspectives on the future are opened up.

Achieving Basic Needs: Some General Considerations

Until very recently it was common merely to set a target of development policy, often expressed in terms of a desired aggregate rate of growth, without inquiring deeply into what its attainment would imply in terms of the alleviation of poverty. Recently, the increased concern with issues of poverty and inequality has led several institutions to try to estimate in quantitative terms the likely impact of alternative development policies on particular social groups over a given period of time. This can be done by building mathematical "models" which illustrate in a simplified form how an economy functions. These models can be of greater or lesser complexity but all are based upon explicit assumptions about some key economic relationships and variables. As far as possible these assumptions are based upon empirical evidence on the structure and behavior of economies in the real world. The models can then be used to simulate what might happen if one or more policy changes are introduced, either on the assumption that all other variables remain constant or that they will react in specific, defined ways as indicated by real-life experience.

One example of such a model was developed for the World Bank jointly by the Bank's staff and the Institute of Development Studies at the University of Sussex, England. The main elements and findings can be summarized as follows: First, the skeletal framework of a "typical" developing country at the present time was established. It does not reflect the structure of any particular country, but the figures used do take into account empirical data on different types of country, especially Latin American countries. For simplicity, the households are divided into three groups, rich, middle, and poor, corresponding to the top 20 per cent, middle 40 per cent and the lower 40 per cent of the population

ranked by income levels. The incomes received by individual households and groups come from two sources: the ownership of productive capital assets and from wage employment. Estimates for the existing levels of capital stock owned by each group, the productivity of that capital, and the relative share of wages and profits in those sectors which employ hired labor, are then used to obtain figures for average income in each group and for their shares of the total national income. It is assumed initially that the poorest 40 per cent of the population receive US$34 per head and 12.6 per cent of disposable income, compared with US$303 per head and 56.5 per cent received by the richest 20 per cent of the population. This corresponds with a moderately high income inequality as revealed by the income distribution data for a number of countries.

The second stage was then to examine what would happen to income levels and shares should a "normal" growth pattern be continued for the next few decades, assuming more or less a continuance of the existing policy mix. For this purpose it was assumed that the poor would save a smaller proportion of their incomes than the rich, but their saving propensity would increase as their incomes grew. Their own capital stock (used for self-employment) would increase correspondingly. It was also assumed that the population growth rate would be higher among the poor (3 per cent per annum) than among the middle and higher income groups which would be 2.5 per cent and 2 per cent respectively. Furthermore, a small increase in the productivity of capital was anticipated in the sectors with hired labor, reflecting better nutrition, health and access to education opportunities, but the productivity of the capital owned by the poor would remain static.

On these assumptions, over the next 30 years the average per capita income of the "typical" developing country would rise from $107 to $241, i.e. it would grow at a rate of 2.7 per cent per annum (compared with a target of 3.5 per cent in the United Nations Strategy for the Second Development Decade), and the average income of the lower 40 per cent would increase from $34 to $47, but their share would decline from 12.6 per cent to 12.3 per cent. The model further specifies that if population increase were reduced to 2 per cent in all socio-economic groups, and all other things remained the same, the average income of the poor would rise to $109 and their share to 14.4 per cent.

The final stage in the use of the model was to examine effects of three major policy changes on the growth pattern over the same period of time. The first consists of a policy of wage restraint, lowering the share of wages paid to the middle and poor income groups in order to increase the share of profits. The objective is to raise the rate of growth in total income by increasing the investment ratio. Given the magnitudes used in the model, the policy appears to be successful in that respect but at the expense of greater inequality and a substantially

slower increase in the incomes of the poor. The next two policies consist of transferring resources, either for consumption or investment, to the poor. It is assumed that there is an annual transfer from the rich to the poor of 2 per cent of total income. This redistribution is assumed to be achieved by reducing savings and investment by the rich without lowering their current consumption level.

The policy of consumption transfers raises the incomes of the poor initially. But because these transfers have an adverse effect on the rate of capital accumulation the average rate of growth of incomes slows down in all sectors. After 30 years the poor, and everyone else, would appear to be worse off than they would be if a "normal" growth pattern were maintained. The third policy option considered is a redirection of investment flows. In this variant, 2 per cent of the GNP is transferred to the poor each year not for consumption but for investment in various forms of capital assets, so as to raise production and incomes of the poor directly and exclusively. Various instruments could be used for this purpose: provisions of credit and physical inputs, access to physical infrastructure (roads, irrigation, drainage, etc.), investment in human capital, etc. The model assumes that this redirected capital investment would be used less efficiently than elsewhere. Nevertheless, the effect is to accelerate significantly the rate of income growth among the poor. After 30 years the average income of the poorest 40 per cent in the "typical" developing country would appear to reach $104, i. e. it would triple compared with the base year. Their share would rise from 12. 6 per cent to 19. 4 per cent.

Although this model does not include any initial measure of redistribution, the authors of the World Bank study believe that, because land is the main capital asset available to the rural poor, an initial redistribution through land reform or improved tenancy systems may be a necessary first step in those countries where land ownership remains highly concentrated. In others, the elimination of acute poverty may be accelerated by incremental investment reallocations at a higher level (e. g. 3 instead of 2 per cent of the GNP per annum). The main policy implications derived from the model place the emphasis on a shift in the pattern and structure of income growth and asset ownership over time. This could be achieved by redirecting part of the addition to total investment funds which becomes available each year as a result of growth. This "investment transfer" could be brought about by fiscal and other policies by governments, by changes in the credit policies of financial institutions, and by a reorientation of foreign aid towards the poorest groups.

An alternative model concentrates not on income but on achieving a set of targets, expressed in physical units, for the "hard-core" of the poor, which is taken to be the poorest 20 per cent of the population. In an attempt to determine the feasibility of reaching a set of basic-needs targets within a certain time period, such targets have been set for food,

for housing and for education. There is also an implied health target resulting from the maximization of life expectancy at birth through the achievement of the food, housing and education targets. The models used are constructed on the assumption that the proportion of national income devoted to the production of these three items remains more or less constant, so that, for example, the target level for food is not reached at the expense of the production of some other items like clothing.

Table 1 shows basic-needs target levels compiled by the Fundación Bariloche in Argentina. The target for food is set in terms of the average daily intake of dietary energy per person, and is based on estimates of nutritional requirements arrived at by the FAO and the WHO. The latest knowledge assumes that protein needs are generally met when dietary energy needs are met, so that the food target can be set in terms of this single parameter. The housing target is in terms of square meters per person, and based on United Nations standards. The education target is the percentage enrollment of children aged 7-16 in school. This involves nine years of education for the young, and corresponds to the duration of compulsory schooling which many developing countries and most developed countries have already passed into law.

Table 1. Basic-needs targets in developing countries

Region	Dietary energy [1] (kilocalories per head per day)	Education (percentage enrolment of children aged 7-16)	Housing (m^2 per person)
Africa (arid)	2 360	98	5.25
Africa (tropical)	2 240	98	5.25
Asia [2] (medium and low income)	2 216	98	5.25
Asia (China)	2 180	98	5.25
Latin America (low income)	2 380	98	7.50
Latin America (medium income)	2 380	98	7.50

[1] Targets from FAO: *Provisional Indicative World Plan for Agricultural Development* (Rome, 1969). [2] Excluding China.

The data in the table are all averages, and thus represent only a first step. Some regions, of course, are more developed than others and hence have less far to go to meet the minimum targets specified. For example, in 1970 the medium-income countries of Latin America had already attained 81 per cent of the education target whereas, at the other extreme, the arid regions of Africa had met only 38 per cent of the target. Similarly, as regards housing, only 60 per cent of the basic-needs standard had been achieved in Asia, while the low-income countries of Latin America had reached 80 per cent of the standard. The achievement of the dietary energy target was already over 90 per cent of the average in all regions.

There is, however, no guarantee or even likelihood that the needs of the poor are satisfied when average needs are met. Furthermore, any shortfall in achieving average basic needs targets will mainly hit the poor. Thus the fact, for instance, that Asia as a whole had only an 8 per cent shortfall in dietary energy is perfectly compatible with large numbers in the poorer population groups not meeting their food requirements even in years of good harvests. Further calculations were therefore made within the ILO taking the poorest 20 per cent of families as the target group. Under this model, if the targets for this group are achieved on average, virtually all households will have satisfied their basic needs. Some families - the number depending on the distribution of income - will, of course, have exceeded the standards, while the few with incomes below the average of the lowest quintile will still have fallen short.

It is then assumed that the objective is to meet basic needs within one generation, which for the purposes of calculation is taken to be the year 2000. There is therefore a production target (basic-needs), a target group (the poorest 20 per cent of households) and a time-horizon (one generation). The model calculates an income level at which basic-needs targets are met, and compares that income level with the existing income of the poorest 20 per cent. In the illustrative examples presented below, it is assumed that population growth follows the United Nation's low projection, implying a rapid decline in the rate of demographic expansion. The model then enables the twin role of redistribution and growth in reaching the target income for the poor to be shown. The aim is to meet the basic needs of that group by the year 2000, or within a single generation.

One way to achieve basic needs within the postulated time-horizon, as has been indicated, would be through rapid growth alone. This policy represents a continuation of the status quo as regards the distribution of income and evidently is more feasible the higher is the initial level of consumption of the poor. The latter, in turn, depends upon the average level of income and its distribution. The first column of table 2 indicates the required rates of GNP growth in seven developing regions. These rates range from 6 per cent in China to 11.3 per cent in the oil-producing countries of the Middle East and Africa. In the other five regions the required rates of growth cluster around 9 to 11 per cent.

Unless income distribution changes significantly, the basic needs of the target group can only be met, according to the model, within one generation by rates of growth of output which are nearly double the already rapid rates achieved in recent years. There are two major exceptions to this generalization: China and the oil-producing countries. In the rest of the developing world the achievement of basic needs would demand, under the model, a combination of roughly doubling the rate of growth of output and rapidly reducing the rate of growth of the population. It is unlikely that either, let alone both, of these conditions could be achieved.

Table 2. Annual growth rates of GNP required under alternative policies to achieve basic needs by the year 2000

Region	Rapid growth policy (per cent per annum)	Income redistribution policy (per cent per annum)
Africa (arid)	11.2	8.8
Africa (tropical)	11.1	8.4
Asia [1] (medium and low income)	9.7	7.2
Asia (China)	6.0	6.0
Latin America (low income)	9.4	6.8
Latin America (medium income)	8.7	6.7
Middle East/Africa (oil)	11.3	11.3

[1] Excluding China.

Source: Joseph J. Stern: *Growth and redistribution*, preliminary report prepared for the ILO by Harvard University, Dec. 1975.

The figures in the table are merely a first approximation and give no more than orders of magnitude. It must be recognized, however, that the calculations do not allow for any spontaneous improvements in income distribution. The calculations also probably understate the value of housing and food produced by households for their own consumption (and thus include no costs for processing, transport and marketing), nor do they take into account the stimulus that a basic-needs strategy is likely to give to the satisfaction of needs in this way. They do not allow for the fact that the poor will certainly devote a higher proportion of their income to the satisfaction of their basic needs than the proportion of national average per head income that is so used. Finally, they assume that the present highly unequal pattern of access to public services will not change.

Nevertheless, the projections may on balance be too optimistic rather than too pessimistic in their assumptions. The model uses the low variant of the United Nations population projections, which implies an early and substantial reduction in fertility. It may be reasonable to assume that the early satisfaction of the basic needs of the poor, and the consequent raising of aspirations, will itself contribute to the reduction of fertility. But without a shift to a basic-needs strategy, the rural areas will continue to stagnate, and the pattern of the provision of public services will continue to exacerbate rather than redress inequalities in earned incomes. Reliance on rapid growth on its own, under the model, is quite likely to worsen the pattern of income distribution, and still further delay the meeting of the basic-needs targets of the poor.

Another way of meeting basic needs was therefore examined, namely by combining rapid growth with substantial redistribution. In making the calculations reported in the second column of table 2, it was assumed

that the rate of growth would not fall below the average of recent years. A lower limit was also set to the extent to which reduction in the inequality of income distribution is feasible. (Since the model on which the calculations are based specifies only the distribution at the terminal year, i. e. the year 2000, it makes no difference to the outcome whether there is an initial, once-for-all redistribution at the beginning of the period or a smaller redistribution in each of the 30 years between 1970 and 2000.) The figures in the second column of the table indicate that if substantial income redistribution policies were introduced, most developing countries would appear to achieve the basic-needs objectives by growth at an annual rate of approximately 7 to 8 per cent. The required rates of growth still would be higher than those currently experienced in the majority of countries, but they would not be markedly higher. Indeed, the oil-exporting countries would need only continue at their present rate of growth to meet the targets; no redistributive measures would be necessary.

Conclusions. All these calculations, tentative though they be, strongly suggest that in many countries minimum income and standards of living for the poor cannot be achieved, even by the year 2000, without some acceleration of present average rates of growth, accompanied by a number of measures aiming at changing the pattern of growth and use of productive resources by the various income groups; in a number of cases these measures would probably have to include an initial redistribution of resources, in particular, land. The policy package to be adopted will obviously depend on the situation of each country.

To achieve the satisfaction of basic needs within a generation will therefore require action on all fronts, both redistribution and growth together. To be of use, this redistribution must result in the production of more basic goods and services. The provision of adequate employment opportunities is an essential ingredient in this strategy. The productive mobilization of the unemployed, the seasonally unemployed and the underemployed, plus higher productivity by the working poor, are essential means of ensuring both a level of output high enough to meet basic-needs targets and its proper distribution. Redistribution of the ownership of or access to land and other productive resources, and stimulating the introduction of the right kind of technology, are also likely to be, in a number of countries, a major means of raising the level of productivity of the working poor. When combined with a reorientation of public services, it should bring about an improved distribution of income. But it should be pointed out that, in any case, the proposed strategy implies quite high levels of investment, without which there would be neither growth nor meaningful redistribution.

[Extracted from Chapter 2 of Employment Growth and Basic Needs, pp. 31-43. Copyright © The International Labour Office, Geneva, Switzerland, 1976]

WORK IN PROGRESS ON
AN EMBANKMENT NEAR
KHARA-KABALE ROAD, UGANDA
(PHOTO: YUTAKA NAGATA FOR IDA.)

The Substitution of Labor and Equipment in Civil Construction

I. K. Sud, C. G. Harral and
B. P. Coukis

[The substitution of labor for capital equipment to boost employment in civil construction work is feasible. But unless wages are very low, improvements in efficiency by organizational changes, careful selection and combination of techniques, and managerial change will be necessary to hold down costs.]

It is widely acknowledged that productive employment opportunities should be created for large segments of population in order to foster economic development with distributional equity in countries where underemployment is widespread. In this regard, the present dominance of highly capital-intensive technologies in capital-scarce, labor-abundant economies has brought into question the appropriateness of the technology in use. It is argued that the pool of unemployed and underemployed labor is an important resource which could contribute to real capital formation and income if only "appropriate technologies" could be found which employ this resource productively. The need for reconsidering technology is perhaps most apparent in civil construction, where a pronounced dichotomy exists between the modern capital-intensive technology and the traditional labor-intensive technology of civil construction. The output of a modern machine, typically costing in excess of US$100,000, is equivalent to the output of several hundred laborers. Further, civil works in the form of roads, irrigation channels, dams, reservoirs, etc., account for a major part of real domestic capital

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formation. The employment potential in these investments is indeed substantial.

The initial phase of the World Bank study which is summarized here confirmed the technical feasibility of the substitution of labor for equipment for a wide range of construction activities. However, economic feasibility, which depends on relative factor prices and productivities, could not be assessed because of inadequate information on the productivity of labor under different conditions. The second phase of the study, therefore, focused on collecting field observations of ongoing construction activities on 30 road, irrigation and dam construction sites in India and Indonesia to obtain the production relationships between varying inputs of equipment and labor and the output of different tasks of civil construction.

Based on the evidence on hand at the end of the second phase of the study, it was concluded that the traditional labor-intensive methods of construction that were being observed were not economically competitive with modern equipment even at extremely low wage rates. The reasons for this were believed to be: (a) the inefficiency of the technology employed; (b) a lack of proper organization and management; and (c) the fact that labor-intensive methods were observed under conditions where the primary emphasis was on employment creation rather than the productive use of labor. Phase III of the study was initiated in late 1973 to examine ways in which the efficiency of labor-intensive methods could be enhanced by the introduction of improved hardware, project organization, management and incentives. The principal conclusions were the following.

1) Labor-intensive methods are technically feasible for a wide range of construction activities and can generally produce the same quality of product as equipment-intensive methods.

2) Traditional labor-intensive civil works as observed in the course of this study are inefficient and economically inferior to capital-intensive works except at extremely low wage levels. However, labor productivity can be increased very significantly by the introduction of certain organizational, management and mechanical improvements.

3) With superior tools, high incentives, and good management, labor productivity can be improved to the point that labor-intensive methods can be fully competitive with equipment-intensive methods for wages under US$1.00 per day at present (1976) prices for equipment and fuel. For base wages above US$2.00 per day, labor-intensive methods are unlikely to be economically justifiable; for wages between US$1.00 and US$2.00 per day the economic viability will depend on

various factors. Of course, these "break-even wages" would change with changes in the price of equipment and fuel.

4) There is considerable scope for increasing labor productivity by the use of available off-the-shelf hardware, and by improvements in the quality of tools. The prospect for developing new "intermediate technologies" for civil construction may be limited, however.

5) The prevalence of low wage rates (under US$1.00 per day) merely indicates a potential for the use of labor-intensive methods. Adequate organization and management particularly designed for labor-intensive projects is a critical consideration in adopting labor-intensive methods on a large scale.

6) The availability of adequate labor supply during construction periods is a much more significant factor than has generally been considered, even in labor-abundant economies. Labor requirements for civil works are quite specific in time and space, and it is therefore not sufficient to have an aggregate stock of surplus labor in a region. The required flow of labor at the construction site when needed is the relevant consideration.

7) The health and nutrition status of construction workers can have a significant effect on worker productivity.

8) Alterations of project design can in some circumstances improve the feasibility of using labor-intensive technologies; but any resulting change, or deferral in project benefits, must be explicitly recognized and justified.

Technical and Economic Feasibility of Labor-Intensive Technologies

Technical feasibility. Civil construction basically consists of the integration of a small number of repetitive tasks. Although the range of feasible technologies is limited for some tasks, most of them can be accomplished using a wide range of technology from the most labor-intensive to the most capital-intensive. In theory any combination of technologies may be specified for the various tasks; but in practice the use of a certain technology (say equipment) for any one task may dictate the use of a similar technology for some or all of the other tasks in a project.

Earthworks, including haulage of aggregates and other materials,

is overall the single most important task of civil construction and typically accounts for up to 50 percent of expenditures on civil construction. Earthworks can be broken down into the activities of ripping (if required), excavation, loading of excavated material into a haulage vehicle, hauling, unloading, spreading, and compaction; several of these activities may be combined into a single operation in different technologies. Manual excavation and loading can be combined with a variety of haulage modes -- headbaskets, wheelbarrows of different types, various types of animals, tractor/trailer combinations, and flat-bed trucks -- and manual unloading and spreading as necessary. Equipment-intensive methods for earthworks include bulldozers, excavators with haulage vehicles, and towed and motorized scrapers of various sizes and specifications. Compaction may be carried out by self-propelled and tractor or animal-towed rollers of various designs. The compaction standards normally achieved by the latter are not comparable to those by fully mechanical means of compaction on labor-intensive projects, even though the output of the compaction equipment is considerably higher than the labor gangs generally engaged on any one site, resulting in a low utilization of equipment.

Besides earthworks, production of aggregates (hard material, e. g. stones, to mix with cement or tar) and pavement construction are other major tasks of civil construction. Aggregate production can be carried out entirely by manual methods, or by mechanical crushers of varying sizes; but hand crushing cannot economically achieve gradation standards comparable to those achieved by mechanical crushers. Although the larger crushing plants may be highly automated, a significant number of laborers can be employed along with small-scale crushers for such activities as loading and hauling of stock piles. Pavement construction involves two main tasks which require a significant labor input. These are the laying of the base, e. g. water-bound macadam (WBM) and the laying of the surface, either premix carpet or bituminous surface dressing. The laying of WBM is peculiar to labor-intensive road construction and therefore no strictly comparable equipment-intensive methods are available. Most premix carpet can be laid either by conventional mechanical pavers, which have relatively high output rates, or by manual methods which may be suitable for working with smaller size hot-mix plants. However, the quality of machine-laid surface is normally superior as measured by its surface roughness.

From a technical point of view, most major tasks of civil construction can be carried out by various labor-intensive methods working generally to the same tolerances as machines. But for a few selected activities, changes in design standards may be necessary to offset the advantage of machinery, with some loss of benefit.

Economic feasibility. Whether or not labor-intensive methods are economically feasible depends on the productivity of different technol-

ogies and the relative prices of labor and equipment. For the tasks of civil construction, the productivity of particular labor-intensive methods with alternative assumptions of wage rates can be compared with the cost of the same task by equipment-intensive methods to determine the economic "break-even" wages for labor at which the costs of the two methods are equal. The lower the productivity of labor, the lower would be the break-even wage, and vice versa. Early conclusions of this study indicated extremely low productivity of traditional labor-intensive technologies, which, at the prices for equipment and fuel then prevailing (1973), could not be economically competitive with equipment except at extremely low wages.

Clearly the economic feasibility of labor-intensive techniques depends on the possibilities for increasing the productivity of labor. Subsequent field work carried out in the study indicates that substantial improvements in labor productivity in certain tasks are achievable by improvements in basic tools, worker incentives and site management. Labor productivity in excavating hard soils, for example, can increase from $2m^3$ per man-day to $5m^3$ per man-day with high incentives and better quality shovels. Further increases of 50-100 percent can be achieved by pre-ripping of soil by animal-drawn ploughs. Labor productivity in haulage by wheelbarrow with ball-bearings can be 50 percent more than that with many conventionally available wheelbarrows. Use of rail wagons and aerial ropeways can increase labor productivity significantly in specific site conditions where large quantities of material are to be moved or where a substantial lift is involved. Production of aggregates by manual methods can be improved by the use of specially designed hammers. With the types of productivity increases indicated above, the economic break-even wages for labor-intensive methods are much higher at current (1976) prices of equipment and fuel than were those indicated in the earlier phase of the study.

For generalized comparisons, break-even wages have been calculated by using international prices for equipment and fuel, while local labor costs have been expressed in US dollars. Obviously, the break-even wages will increase or decrease with any future variations in the price of equipment and fuel. Broadly speaking, base wage rates of $1.00 to $1.80 per day combined with an effective incentive system represent the upper limit (in 1976 prices) at which labor-intensive methods can be economically attractive. These wage rates represent the boundary conditions. Between the two, factors such as the nature of work, special site conditions, magnitude of the work, and set-up costs, will determine the economic feasibility of labor-intensive technologies.

Typical unit costs of earthworks for a few selected technologies at varying wage rates and alternative haul lengths are depicted in Figure 1. For each method, a lower and upper bound is given, reflecting the range of productivities under favorable conditions (high incentive wages and good supervision) and poor conditions (daily wages and poor super-

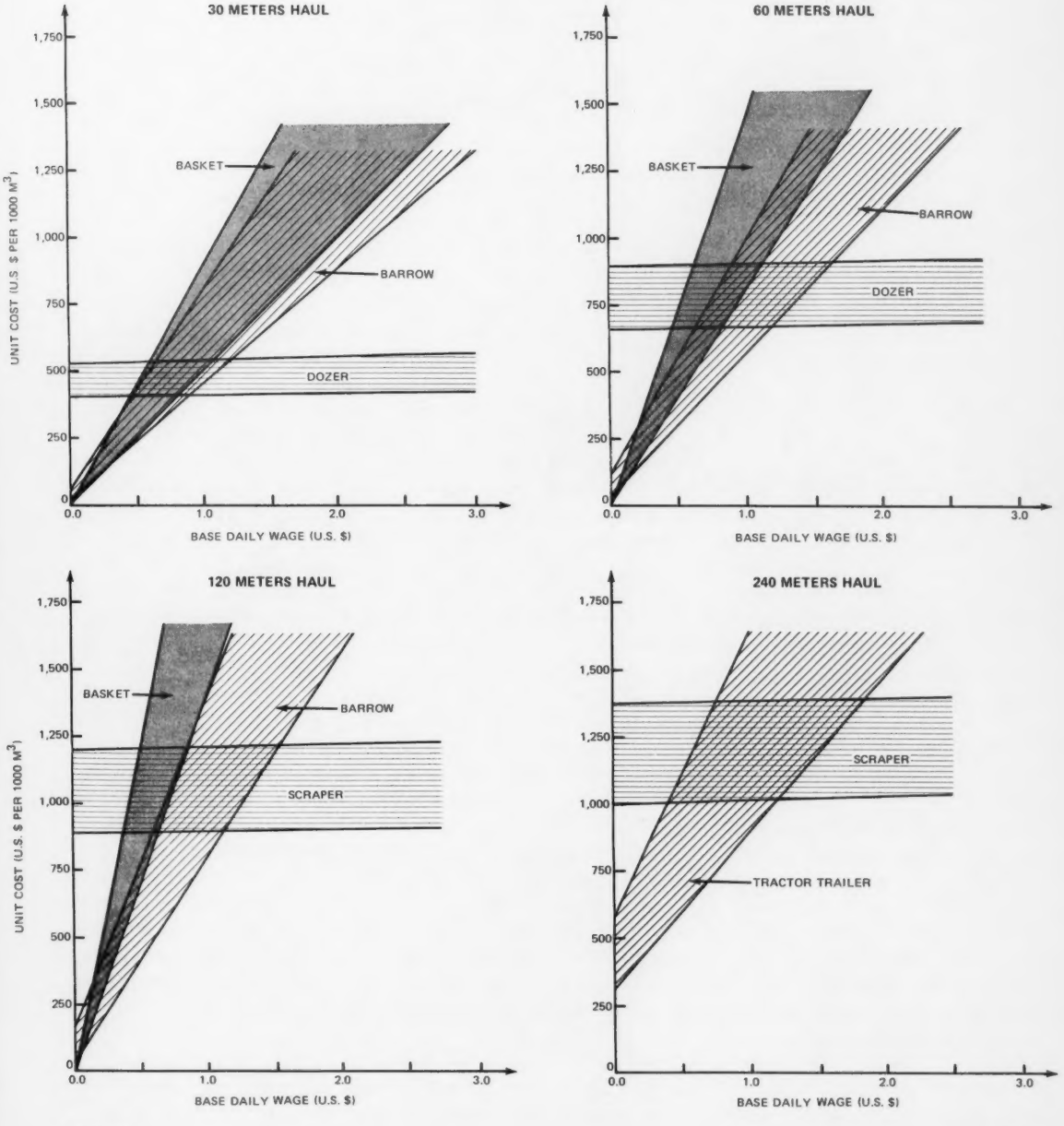
vision). Comparing extremes, it can be seen from the figures for all haul distances that the unimproved labor-intensive method is not economically competitive with efficient equipment-intensive methods except at wage rates of the order of US$0.40 to US$0.50 per day or less. However, by introducing small scale equipment, improved supervision and high wage incentives, productivity can be increased several fold and labor-intensive methods become economical at base wage rates up to about US$1.20 per day when compared to the more efficient equipment-intensive operation, or as high as US$1.60 to US$1.80 per day when compared to less efficient equipment operation. This comparison includes allowances for the cost of the equipment, for wage incentive supplements equal to the base daily wage (to reward additional effort and skills), and an additional overhead allowance of thirty percent for the cost of superior supervision, as consistent with field observations.

Technical considerations would dictate the use of mechanical compaction even on labor-intensive projects. On a larger project this would pose no special difficulties, as the cost of compaction would generally be only a small part of the total project cost. However, on many smaller and scattered labor-intensive jobs (e.g. feeder road construction) such compaction equipment would have a very low utilization because of the small quantities of work involved, and it may be more economical to use animal-or tractor-towed rollers with an acceptable reduction of compaction standards. These are explicit trade-offs which must be considered in the design and organization of the project, as discussed below.

Break-even wages have also been computed for other important tasks. For aggregate production, larger size aggregates (greater than 25mm) can be produced more economically by labor with proper incentives at wages under US$1.00 per day, whereas small aggregates for chippings, etc. are produced more economically by mechanical crushers. However, limited evidence from the study suggests that at low wage rates, smaller size aggregates may be produced more economically by first pre-breaking of larger stones by hand to about 50 mm size and then crushing by machine. It should be noted that improved design can increase productivities as much as 50 percent, but there appears little prospect for increasing productivity by further altering the technology short of switching to a mechanical crusher.

Laying of hot premix carpet can be accomplished much more economically by labor for typical project conditions in developing countries where the quantity of work and the output rate required may be relatively small. This is because the available paving machines are of high capacity (70-80 tons per hour) and consequently entail considerable idle time. In one instance in India, the cost of laying premix carpet by hand was estimated to be US$0.06 per ton and by a mechanical paver to be US$0.85 per ton when both methods were used in conjunction with a 25-30 ton/hour capacity hot mix plant. However, the quality of machine-laid surface

FIGURE 1 COMPARATIVE UNIT COSTS OF EARTHWORKS BY DIFFERENT METHODS AS A FUNCTION OF HAUL DISTANCE AND WAGE RATE



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was markedly superior. In this case, the increased user costs resulting from lowered surface standard had to be weighed against the reduction in the cost of surfacing. User cost considerations may be significant for highly trafficked roads, but are less important for feeder roads or roads with heavy volumes of slow moving traffic.

Prospects for "Intermediate" Technologies

The extreme contrasts between the available labor-intensive technologies and the modern equipment-intensive technologies have prompted the study to focus attention on the development of "intermediate" technologies. It was thought that technologies could be developed between the two extremes which require considerably less capital per unit of output, a smaller investment per machine (less lumpiness), and which would enhance labor productivity so that these technologies would be economically efficient at higher wage rates than the traditional labor-intensive technologies.

Development of intermediate technologies can be envisaged in two ways. Starting with the equipment-intensive end of the spectrum, the size and production capacity of equipment can be reduced in steps, thereby decreasing the capital content and increasing the labor content of any given task. Various earthmoving machines, for example, can be replaced by smaller size equipment. Alternatively, starting from the labor-intensive end, capital can be substituted for labor in small increments for some of the activities of a task in such a way that the overall labor productivity is enhanced, which can more than offset the incremental increase in the capital cost. For example, labor productivity in earthworks can be increased by the use of superior excavating and loading tools, by substituting wheelbarrows for headbaskets, by introduction of improved design wheelbarrows, use of rail carts, animal-drawn carts, etc. The Bank study explored the development of intermediate technologies principally from the labor-intensive end of the spectrum. Field trials were carried out not only with the available off-the-shelf hardware and tools with improved designs, but also with innovations in hand and animal carts, winches, animal and tractor-drawn scrapers, lever cranes, monorails, etc. Substantial improvements in labor productivity were obtained by the proper selection and adaptation of conventional hardware, although the more innovative devices did not prove to be very successful. It appears that for most tasks of civil construction, and under the site conditions usually encountered on civil works projects, the available hardware may represent the best of the intermediate technologies.

Two factors support this conclusion. First, the output of any labor-based technologies is limited by the physical constraints of energy of a worker. Various types of mechanical advantages (wheels, levers, inclined planes, etc.) can be provided to an individual to ensure that

Comparison Of Some Capital- And Labor-Intensive Methods In Road Building

Left: Leveling with handtools on a rural access roads program, Kenya. (Photo: World Bank)

Right: Heavy earth moving equipment leveling roadway between Tetouan and Tangiere, Morocco. (Photo: Bill and Christine Graham for World Bank and International Development Association)

only a minimum of energy is wasted. The conventional hardware generally serves this purpose. Further increases in productivity are only possible by switching to a machine-generated source of power, which in turn entails a major jump in labor productivity and a major increase in capital intensity of the task. Once a switch is made to machine-based technologies, however, there is a minimum size of machines below which the machine operation is not economical. Thus, although a farm tractor could be used in excavation, its cost per unit of output is considerably higher than that of a conventional bulldozer, because it does not have the horsepower and weight necessary for ripping or shearing the soil efficiently.

The second reason for the lack of success with new intermediate technologies seems to be the complexity they introduce in the execution of the task. Introduction of these technologies for one or more activities of a task requires a close coordination with the remaining activities to be able to realize the expected gains in productivity. For example, haulage by wheelbarrows and carts, which already represents a major improvement on haulage by headbaskets, could be further improved in some circumstances by resorting to a fixed rail system. But this requires a proper set-up of the rails and the balancing of loaders and unloaders at the two ends of the system to match the haulage cycle of the rail, without which the rail haulage becomes much less efficient. Such close coordination is often not achievable under typical site conditions in civil construction projects. Similarly, switching to machine based technologies for any one part of a task generally dictates the use of machines for all other activities of the task because of the large imbalances between men and machine productivities.

Thus the prospect for developing new intermediate technologies between the limits of an efficient labor-intensive technology based on human muscle and modern equipment technologies based on other sources of energy are not very encouraging. Such a technology would hinge on the development of small scale equipment which could efficiently substitute other sources of energy for human muscle. However, the evidence to date suggests that there are limits on the degree to which equipment can be fragmented without experiencing losses due to the inherent economies of scale to be found in fossil produced sources of energy. The employment effects of using such a technology will be small (compared to human muscle based technologies) and will primarily involve the use of skilled labor. Undoubtedly there are some improvements that can be made in adapting modern machine-based technologies to conditions found in developing countries, and it will certainly be worthwhile to do so; but their employment effects are likely to be marginal.

Organization and Management Requirements

Much of the discussion on the economic efficiency of labor-intensive

methods has in the past been primarily based on the type of micro-level cost comparisons of alternative technologies described above. However, such comparisons merely indicate the range of wage rates (and other factor costs) for which labor-intensive methods can be economical. Whether labor-intensive methods will in fact be economically implemented at the project and program level is determined by the organization and management capabilities of the public works authority or contractor to recruit, mobilize, organize and supervise large numbers of workers. Inefficiencies in the form of multiple handling of materials, long project gestation periods, and low labor productivity are commonly observed. Thus, the prevalence of labor wage rates at or below the economic break-even wage is a necessary but not sufficient condition for the adoption of labor-intensive technologies.

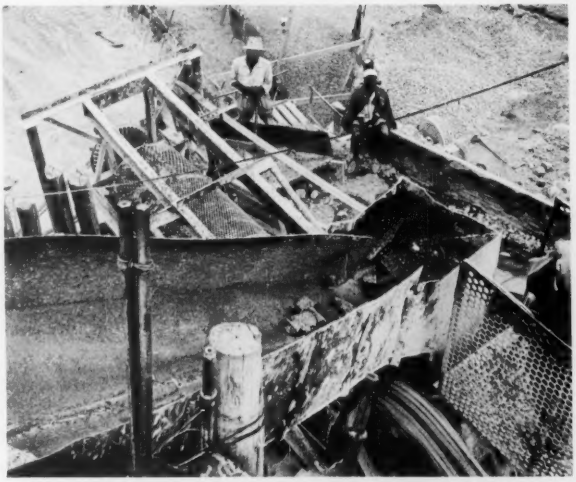
Of course, the need for effective project organization and management exists irrespective of the technology employed. However, what is often not appreciated is the fact that the organization and management requirements of labor-intensive projects are quite different from those of equipment-intensive projects. There are unique problems associated with recruitment, supervision and motivation of labor which call for different supervision skills and a different framework for project organization. These factors are often overlooked by many public works authorities, resulting in a mismatch of supervisory skills and an inappropriate project organization. This may well be the major cause of the inefficiencies which are often observed in labor-intensive works.

Labor Mobilization. Availability of an adequate supply of labor at the project site is obviously a critical consideration in the planning and execution of labor-intensive projects. The labor supply conditions determine not only the relative economics of labor-intensive methods, but also the length of time required for project completion. Even in the most labor abundant economies, the supply of labor to civil construction projects is often inadequate, contributing to long project delays. This is particularly true during the seasons when earnings opportunities in agriculture rise sharply. The tradeoffs between the higher wages necessary to attract an adequate labor force and the economic loss from deferred project benefits caused by insufficient labor must be explicitly defined and recognized.

Most of the arguments in favor of using labor-intensive methods in construction (as in other sectors) are based on the assumption of the existence of surplus labor in agriculture. It has been hypothesized that a stock of surplus labor exists, particularly in the slack agricultural season, which would be diverted to other productive activities without a significant loss in agricultural production. However, the existence of surplus labor during certain seasons does not ensure that labor will be available for employment in civil construction at the specific times when it is required. The willingness to work in civil construction depends on earning differentials (both short-term and long-term) relative to alternative employment, on the "wealth" of the individual (e. g. extent of

Left: Placing hand-shaped stones for a road near Ouagadougou, Upper Volta. (Photo: Ray Witlin for the World Bank)

Right: A mechanical stone crusher in Uganda (Photo: Yutaka Nagata for IDA)



Below Right: Wheelbarrow hauling of crushed stones on conveyor belt from crusher in Ethiopia. (Photo: Kay Muldoon for World Bank)

Below Left: Road repairs done by hand near Kathmandu, Nepal. (Photo: Mary Hill for IDA)

landholdings, if any), any additional work-related costs of food, housing and transport, and on the disutility of work in terms of leisure foregone. In addition, substantial underemployment may be interspersed with essential part-time employment such that it is difficult to utilize productively the time that is available.

The importance of seasonal variations in agriculture is clearly established in the determinants of labor supply for civil construction. In India, agricultural wages typically increase from 30 to 80 percent or more during peak seasons, which are encountered about four months out of the year in rainfed cultivation but may extend to eight months in irrigated areas. Because of the shortage of labor during this period, and because of climatic factors, civil construction is normally halted from sometime in June until October, and periodic interruptions of work occur during the rest of the year. An important fact to be determined is the extent to which labor may be more freely available on a part-time basis for periodic activities (such as maintenance) near to their homes, as opposed to construction activities which demand full time and require substantial travel.

The demand for construction labor fluctuates as the work progresses over the phases of construction. This consideration normally dictates employing labor on a casual basis, i. e. labor is employed as and when necessary. The ability of the project authorities to recruit labor in this way is governed by their sensitivity and responsiveness to the changing labor market conditions. Unless wage rates can be shifted in response to changing site conditions or seasonal supply considerations, wide fluctuations in labor availability can occur. On many sites, it becomes necessary to import labor from other labor surplus regions, which may sometimes be located several hundred miles from the site. In order to attract labor from such distant places, it is generally necessary to provide workers with mobilization advances, travel fares and sometimes even food supplies and shelter for their assignment. Government construction authorities are not well suited to perform such functions as they often require long and personal contacts with these communities. Intermediaries or special contractors are commonly used to perform such functions.

In India, large migratory labor populations have emerged which provide the bulk of the labor force for large scale civil works projects. Migration of hundreds of thousands of workers and their families for construction work, usually in response to specific recruitment drives by contractors, is an annual phenomenon. Migratory workers are provided with either extremely modest or no accommodation at all on site; often low-cost huts are built by the workers for themselves. The existence of this large mobile population, combined with relatively low costs of migration in India, tends to limit wage differentials between regions. The propensity to seasonal migration is higher in those areas and among those classes which have been relatively impoverished over a long term;

notable reluctance to migrate has been observed among those affected by temporary or recent events such as drought or floods. Field investigations in northern and central India in fact show that almost all migrant laborers on construction work are either landless or possess very small holdings. The investigations also confirm that contractors have a strong preference for migrant workers whom they consider more productive, reliable and disciplined. Migrant workers tend to specialize in particular activities, developing skills and often much higher productivities and earnings than casual laborers recruited locally.

The important point to stress is that even in seemingly labor-abundant areas the availability of an adequate supply of labor for civil works cannot be assumed without a careful investigation of the local labor market conditions. Examples of labor-intensive projects which have remained uncompleted for years are unfortunately all too common. The cost of having large sums of capital tied up in unfinished projects does not seem to be fully recognized. An explicit recognition of labor supply constraints may point to either a redesign of the project or the selection of a more capital-intensive technology.

Supervisory Skill Requirements. For the same rate of output, supervision requirements of labor-intensive projects are much greater than those for equipment-intensive projects. For example, the output of a bulldozer employed in earthworks can be as high as 1,000 cubic meters per day, which may be equivalent to the output of 200-300 laborers working in groups of 20 - 30 each. The work of the bulldozer may be carried out by one or two skilled workers, but it would require more than a dozen supervisors to supervise the work of the equivalent number of laborers. In addition, labor is often deployed over a wider geographical area requiring a dispersal of supervision, which further increases supervision requirements.

The skills needed for the supervision of labor rather than machines are also quite different, the former requiring the leadership qualities to motivate large groups of human beings over long periods. Labor is more heterogeneous in its characteristics than equipment and therefore the "style" of supervision is likely to vary widely for labor-intensive projects. Moreover, a task which can be performed in one machine operation may require several gangs of labor working in the different component activities. This imposes an important responsibility on the supervisor to coordinate and sequence the different activities efficiently. For instance, on a road construction project in India it was found that with a proper balance of excavators and haulers, and with a more appropriate sequence of performing the excavation, labor productivity could be more than doubled. In another instance of canal construction in Indonesia, when wheelbarrows were introduced for haulage instead of headbaskets, the expected increase in productivity could not be realized because of the site supervisor's apparent inability to understand the need for a proper balance between excavators, loaders and haulers -- the haulers speeded

up, but only to be delayed in queues because the rate of excavation and loading was inadequate. Other aspects of site supervision of labor-intensive projects which have a major bearing on productivity are the proper selection and maintenance of work tools, which require a good understanding by the supervisors of the principles of manual work.

Unfortunately, such supervision skills require a certain inclination and training for the site supervisors which often do not exist. Even in countries like India and Indonesia where labor-intensive methods of construction have been traditionally used, many of the site supervisors are graduates of polytechnics or engineering schools where the education tends to be oriented towards design engineering and the use of equipment. Frequently these supervisors possess no prior experience in working with labor, and they rarely (if ever) come up from the labor ranks. Indeed, labor-intensive civil works are often seen by governments as a way to absorb the unemployed technical graduates. Under these conditions, the role of these site supervisors in project execution becomes more like the measurement and checking of work done by "quantity surveyors", rather than the labor management done by a "foreman". Thus, for labor-intensive projects to be implemented on a wide scale, it is essential that sufficient numbers of appropriately trained site supervisors be available. In most countries availability of such skilled staff will be a critical constraint in the adoption of labor-intensive methods. A substantial effort is required to implement training programs specifically oriented to labor-intensive works: the nature of the work suggests that on-the-job training would be the most suitable approach.

Wage and Incentive Systems. Management systems which provide wage incentives for efficiency are of paramount concern in labor-intensive works programs. The evidence indicated that incentive payment methods may result in labor productivities up to three times greater than daily wage systems. However, the development and administration of incentive systems is a large and difficult task; at a minimum, job analyses must be carried out and a schedule of productivity norms established. The payment basis must be fully understood and felt to be fair by the labor force, and wage payments must be made regularly and promptly. There must be flexibility so that rates can be revised to reflect particular site conditions. In the case of the Chinese-sponsored road projects in Nepal, elaborate piece rate systems were developed which provided different rates for each task under varying conditions. Development and administration of such incentive schemes can only be done by the site level supervisors, who must therefore possess the necessary skills and authority for this purpose.

Health/Nutrition Considerations. Evidence was collected in the study indicating a significant effect of health and nutrition of workers on productivity. Studies of adult male plantation workers in Indonesia, for example, indicated a significant correlation between iron deficiency anemia

and the output of rubber plantation workers. A simple iron supplementation program at a cost of US$0.50 per worker resulted in increased productivity by up to 25 percent; the benefit/cost ratio of such a program is obviously large. A similar study in India of road construction workers, and an independent study in Jamaica of sugar plantation workers, indicated correlation between output and body weight and dimensions. This would suggest a possible relationship between work output and caloric consumption which can be augmented by locally available food supplements. Present work underway in Kenya is attempting to study the benefits and costs of caloric supplementation. Various public health measures can also be used to reduce the incidence of certain health deficiencies which may limit worker productivity and/or availability. However, there is inadequate knowledge of the delivery mechanisms which may be used for nutritional/health interventions on a scale larger than the experimental level, and further work needs to be done in this area.

Organization Framework. The unique requirements of labor recruitment, payment, supervision and motivation, combined with the geographical dispersion of sites and the major influence of site variables on labor productivity, suggests three main organizational requirements for labor-intensive public works programs:

(a) as much of the decision making as feasible must be delegated to the site level supervisor in order to enable him to respond quickly to changes in site conditions;

(b) sufficient flexibility must be given to site supervisors to shift wage rates, and an incentive needs to be built in for the site manager to ensure that labor is employed productively; and

(c) the organization must be responsive to the relative prices of labor and equipment to ensure that labor-intensive methods are adopted in low wage situations where such methods may be more economical than equipment.

The first two considerations would tend to favor the use of private contractors. The last consideration may necessitate the use of "force account construction", particularly in countries where labor-intensive methods have not been traditionally used in spite of the prevalence of low wage rates. However, both of these systems have certain weaknesses which limit their application to labor-intensive projects.

Private contractors have the necessary flexibility and incentives for carrying out construction projects efficiently. However, established contractors show little inclination to use labor-intensive methods, even in countries like Indonesia where such methods may be more profitable on certain projects. The larger contractors have generally developed specialized expertise in the use of equipment and perceive the use of labor-intensive methods as being management-intensive, time consuming

and generally inefficient. In countries where these contractors can find sufficiently large and specialized jobs (e. g., major bridge contracts in India, large civil works contracts in Indonesia), the smaller jobs are regarded by them to be marginal and therefore they prefer to leave them to the smaller contractors. Moreover, many construction authorities consider access to equipment as a major criterion for judging the contractors' capability to execute works. These and similar regulations inhibit the contractors from adopting labor-intensive methods. In the circumstances it seems unlikely that large contractors will opt for labor intensive methods even if they are free to choose their technology.

The system of "petty" contracting which is widely used in India for smaller works is oriented specifically to the use of labor-intensive methods. Under this system works are sliced into a large number of small contracts varying in value from $10,000 to $100,000 per year. The contractors, by virtue of their small size and fragmented works, have virtually no access to capital and own little or no equipment. Their principal characteristic is the ability to perform labor-intensive works, as the only capital outlays these works require are the funds for the payment of small labor advances and for their current payroll expenditures. While the petty contractor method is effective in ensuring that the contractors will choose labor-intensive methods without the construction authority having to specify this administratively, the system suffers from some drawbacks. Because of their small size, the petty contractors generally possess little or no formal skills in contracting or construction management. Their financial status is so limited that they cannot afford to experiment with unfamiliar technologies. Essential items of equipment, e. g., rollers, must normally be provided by the construction authority. The individual slices of works which are given to the petty contractors tend to be not only small but also limited in scope, as they commonly specialize in particular tasks, e. g., earthworks, stone production, or transport of materials. But fragmentation of this type imposes a major responsibility on the construction authority to schedule and sequence the various contractors' works. In practice this often proves to be a difficult undertaking and numerous instances are observed in the field where the inability of just a single contractor to complete his part of the job prevents other contractors from completing their works.

By using "force account construction" it is possible to specify the appropriate technology to be used. However, force account construction normally implies a centralized, hierarchical management structure, and experience indicates that it is difficult to provide the flexibility required for site staff to respond to varying conditions and to the needs for labor recruitment and payment. Force account construction also generally suffers from a lack of financial discipline and control. With dispersion of sites and fragmentation of resources, financial control of labor-intensive projects becomes even more difficult. However, despite the potential difficulties, force account may provide the only feasible avenue for introduction of labor-intensive methods in those countries where modern

Left: Compacting with heavy equipment in Tanzania. Contrast this method with that of picture below. (Photo: Per Gunvall for IDA)

Right: Using manual compaction techniques in a road building project in Kenya. (Photo: World Bank)

Left: Sudanese laborers are combining hand shoveling with heavy compacting equipment in a road building project. (Photo: United Nations)

equipment has become the established technology. In these circumstances force account programs may be used to test the efficiency of alternative labor-intensive methods, evaluate different management schemes and develop a reservoir of skilled manpower familiar with the use of labor-intensive methods. By demonstrating through such programs that labor-intensive methods can be cost effective, the element of risk will be reduced and the adoption of similar methods by the contracting industry encouraged.

Project Design

There are three ways in which the design of a civil works project can be altered to make the project amenable to construction by labor-intensive methods. These are:

(a) Selection of a basic design concept or type of project which has a high labor component: e. g., in the irrigation sector a choice may sometimes be possible between surface water schemes, which can largely be carried out by labor-intensive methods, and ground water schemes which are generally capital-intensive.

(b) Variation in project scale and timing to conform to the availability of labor: e. g., a large irrigation channel can sometimes be subdivided into two smaller channels, or a road can be constructed to low standards initially and upgraded in subsequent stages as labor is available.

(c) Variation in engineering design and specifications: e. g., earthworks in irrigation channels may be reduced by lining the channels, and the use of masonry rather than concrete lining materials creates further employment; similarly, relaxation of aggregate gradation standards and specification of larger size stone in pavement construction will enhance the feasibility of labor-intensive methods.

Where a labor-intensive design solution which yields the same or similar performance standards cannot be found, labor-intensive methods may be more competitive for lower design standards or slower implementation schedules. In these cases the reduced or deferred benefits must be explicitly recognized, and a comparison of benefit and cost streams made for alternative designs.

Promoting Labor-Intensive Technologies in Pilot Programs

The results of the Bank study have highlighted certain conditions necessary for the successful (economical) implementation of labor-intensive technologies. Availability of labor for civil construction

at low wage (or opportunity cost) is, of course, a prerequisite, and the extent to which labor-intensive methods can be adopted would depend upon the elasticity of labor supply. But whether labor-intensive methods could be implemented on a large scale is determined by the organization and management capabilities of the construction authorities. Development of such capabilities must be undertaken simultaneously with the adoption of labor-intensive technologies, particularly in countries where such methods have not been traditionally employed. This is likely to be a slow and difficult process and the effort required for it should not be underestimated. It would be necessary initially to provide major inputs of technical assistance for training of staff from the foreman to the supervisory engineers and project planners on pilot construction programs. These programs, while providing training for staff, could also serve as "demonstration programs" for labor-intensive technologies and expanded in their coverage as the organization capability is developed. Ultimately, the programs should aim at the development of a local contracting industry which would be geared towards the use of labor-intensive programs.

[Extracted from "Scope for the Substitution of Labor and Equipment in Civil Construction," pp. 1-18, an unpublished progress report on the study described as of July, 1976. The views expressed are those of the authors, not necessarily those of the World Bank or other sponsors of the study.]

Below:

Finishing a road near Msata between Dar es Salaam and Tanga in Tanzania, using heavy equipment and labor intensive techniques.

Socio-Economic Impact of Rural Roads in Mexico

Secretariat of Public Works of
the Government of Mexico

[A Mexican study analyzes the effects of new roads built in relatively isolated rural areas, both from the improvements in communication and from employment of villagers in road construction. Impacts vary widely: generally the villages, and the families within them, that have more resources benefit most, but there are often wider gains as well.]

Despite the accelerated urbanization in Mexico over the last 30 years, 41.3% of the population were still living in communities of less than 2,500 inhabitants as of 1970. The isolation of many of these rural communities acts as a brake on their potential for development, even where there are conditions for exploiting natural resources. A study has been undertaken to examine the socio-economic effects of a road construction program in rural areas; it stresses the use of intensive labor, relying mainly on manual tools such as picks and shovels and wheelbarrows.

The primary function of a road is to provide rapid communication and greater hauling capacity, incorporating one or more settlements into the economic system from which they have been isolated: it is an access bridge to an exchange system, a market in which the potentials for economic growth will gradually be found. Thus, the most important effects of communication links can only be observed after a reasonable time elapses to allow a process of expansion to take place - should this occur. In some cases the effects may be immediately noticeable,

Translated from Spanish
by Katie Furcron.

as when a production surplus exists which could not previously be "exported"; but in other cases the process will be slower, given the time needed for bringing land under cultivation or developing other natural resources. In addition, short run indirect results from the construction of the road and the jobs it provides are mainly due to the funneling of wages and other purchases into the region. This too could help to initiate a process of change which would eventually increase levels of employment and local production.

The study of all these effects in affected communities, both during and after a construction project, could lead to more or less precise estimates of the impacts of the road construction. In order to explain observed differences among these impacts, it is necessary to study, on the one hand, the different socio-economic conditions in the affected communities and, on the other hand, the characteristics of different families in these communities, and also of individuals (who may or may not have been employed in the road construction). This analysis of characteristics of individuals, families and communities was done with the aim of not only describing how the effects of a road built by local labor are shown, but also to determine to what extent employment is affected in rural areas by a mechanism which is partially designed as a measure to relieve unemployment. The presentation here will include first, some general observations on 79 communities; then more detail on a subsample of 14 of these communities; and finally, a closer look at two contrasting communities in the group.

The 79 Communities Surveyed

In the analysis of 78 roads for which a survey was made of participating workers and their families, information was gathered on 79 rural communities which were linked to the highway network by the roads and from which labor was recruited (in one case the road workers came from two different communities). Two thirds of all these communities had less than 1,000 inhabitants. The majority of these localities were quite isolated: in 71% of the cases the only way of arriving at the nearest settlement was by foot or horseback; in 29% of the cases there was motor access but only during the dry season. One can judge the degree of isolation by the time it takes to arrive at the nearest community either by foot or horseback: in 30% of the cases it takes one hour or less, and in 46% it takes one to three hours. In other communities the process is slower: in 18% three to six hours are required, and the remaining ones, six or more hours.

The paucity of services is a common characteristic of the localities under study: 37% lacked services of any kind; only 19% had drinking water available, primarily without service lines; 30% had electric light; 19%, mail service, and only 14% could count on an irrigation

system. More than half of the communities had elementary schools: in some (13%) grades from 1 to 6, but in the majority of the cases only 3 grades. On the other hand, there were few medical services: only in 13% of the communities were specialized medical services available, and in another 10% there was none of any kind.

Characteristics of the families of individuals who worked on the road are generally typical of the Mexican rural population: large families (an average of 6.3 members; exceeding the national average of 5.5), and with plenty of available labor (an average of 3.6 persons in the family labor force). Most of these are engaged in agriculture, and almost all families are native to the area they live in. Most of the workers' families included in the sample own or rent land (74.0%). The average area is 2.9 hectares per family. The predominant land tenure pattern is the "ejido": 35.5% of the families live on community-owned ejidal lands on which family plots are cultivated, while 23% own their land outright. This is typical in almost all the regions studied. The rural character of the localities where the labor-intensive roads are being built determines the nature of economic activity. Thus, 93% of the families are engaged in the primary sector: 74.9% in crop agriculture and 12.5% in livestock-raising.

Family Employment. From the results obtained on the use of family labor, it was not possible to measure rural unemployment in conventional terms. The analysis of the conditions of employment was made on the family level rather than on the individual level; for the most part the tasks are not carried out individually. The number of members of the family labor force (FLF) was determined per family, i.e. those of working age who participate in some family activity, and an estimate was made of the degree of occupation for the same. This was determined by estimating the time that members of the FLF worked during the year, either as day laborers (in the community or outside of it), working on their own parcel of land, or in other activities (livestock, handicraft, hunting, fishing, etc.). This data was used to determine the number and the proportion of the FLF which was employed or unemployed. The following results were obtained: 25.7% of the total FLF was unemployed in the sense defined, which means that if the average number of available hands is 3.6 in each family, there is in effect the equivalent of one member unemployed. Comparing the number of "unemployed" members of FLF, which is 1,768 persons, with the number of families analyzed (1,913), one can see that 92.4% of the families in the sample had one unemployed member - if one assumes that the unemployment was distributed equally among all the families. In the majority of the cases this explains why no one outside of the family was substituted for most of the individuals who went to work on the road.

The annual average income per family is nearly 7,000 pesos, which

represents an income per person (with an average family size of 6.3 persons) of 1,110 pesos annually, an amount which is much less than the national income per capita (in 1970) of approximately 8,400 pesos. This family income is a more meaningful indicator if one divides it among the number of persons which constitute the family labor force (3.6). This value of 2,102 pesos annually per worker could be considered, given the usual reservations, as the opportunity cost for rural workers and signifies an average income of 8.40 per work day (if each worker is assumed to be occupied approximately 250 days of the year).

The average age of the road workers is around 31 years. Most are married or live in consensual unions (62%); this number corresponds to the number of persons who are heads of family (58%) and those who have children (59%). Bachelors represented 35% of the total of the sampled workers. Most of these workers have less than four years of schooling (76.1%). The others have between 4 and 6 years. On the other hand, 70.5% indicated they knew how to read and 68.9% how to write.

Prior to joining the road project, the workers were occupied, in order of importance, in agricultural tasks (48%), dealing in kindling wood, charcoal and gathering tasks (21.4%), masonry (3.9%), handicrafts (2.1%), students (1.4%), domestic tasks (1.2%), and other occupations (7.5%). In addition, 14.5% indicated they were unoccupied. Thus, the great majority left their agricultural and wood-collecting tasks in order to take the new jobs on the road. Nevertheless, it is probably closer to the truth to assume that the level of participation in such activities had been low and of minor importance. While they were working on the road, 19.3% were substituted for by someone in the family, 2.7% by a day laborer, but for 77.2% no one was substituted. This fact illustrates the high level of visible or hidden unemployment in the primary sector.

The income received by the workers on the road was disbursed in the following manner: 7.4% for purchases of land, work animals or tools which could eventually help to increase family income; and the balance of the income (aside from 10.7% which was not accounted for) was spent on food, clothes, and other consumption items. The demand generated by additional wage funds significantly benefitted the local merchants who acquired 73% of the amounts spent, both those in the workers' villages where 39% was spent, and in nearby larger towns where 34% was channeled (the remaining 27% was not traced). A good percentage of wage funds thus ended up almost immediately in the larger localities where the road workers made their purchases; and the part taken in by the small merchants in the villages was, in large measure, also channeled into the larger towns which supply the goods that are sold to the workers. In this way there was attenuation of the short run effects which could have occured with the concentration of

relatively large amounts in the hands of a few small businesses if the funds are all spent in the same locality where they are earned.

It was observed that bachelors, widows, or separated persons spend larger proportions of their income on land and animal purchases and savings than married people; the latter spend a larger part on consumption. It can also be observed that there is a significant relation between accumulation (purchase of land and animals, and savings) and the availability of land: families having land set aside relatively larger amounts of savings than those who have none.

Sample of 14 Communities

A study of 14 communities attempted to examine village conditions one year or more after the completion of labor-intensive roads, in order to explain the possible effects of construction employment. The choice of the target communities was distributed over eight states. Ten of these villages were located in mountain valleys in the central plateaus which had been isolated until the roads were built. Two communities were located in the coastal plains where the climate was largely tropical rainfall. One village was located in the semi-dry plains of Yucatan, and another in plains with little vegetation and hot climate. Most of these communities are covered by forest, which constitutes 58% of the area of the total sample. The cultivated area is scarcely 21.5% of the whole; most of this land is fertile in season. Grasslands and pastures set aside for the animals represent 7% of the total. The zones in which are found dwellings, communal lands, and poor quality lands represent 13% of the area under study.

A variety of agricultural activities are found, both subsistence and commercial farming, as well as part or full-time occupation in forestry, livestock, fishing, and other services including trade. Taking as a point of departure the division between subsistence farming and commercial farming, five levels of productivity were established: 1. deficit subsistence farming with outside work for wages (1 case); 2. selfsufficiency in food, with minor agricultural trade (2 cases); 3. semi-specialized commercial farming, food growing, cattle and forestry (6 cases); 4. relatively prosperous commercial farms (2 cases); 5. cash crops produced by integrated collective ejido farming units (3 cases). Agricultural technologies also ranged from simple tools up through sophisticated machinery and chemicals with integrated planning.

The distribution of jobs on the road project, in round figures, can be described as follows: a) The largest group represented were peasants who cultivated land and had links to local and regional power groups. Of the 1,049 laborers involved in the road project from the 14 communities 537, or 51%, were small farmers. b) The second group, in order of importance, were permanent or seasonal laborers.

These numbered 420 and represented 40% of the total laborers employed on the roads. c) The least favored group of peasants were the unemployed. Most of them were the sons of "ejidatarios", who generally are obliged to migrate. Only 92 of them were employed, which represented 9% of the total.

The changes which occurred after a period of one to three years had elapsed following completion of the roads may be categorized in the following ways, in increasing importance of change.

1) Settlements in which there was virtually no change (3 cases): a) one-crop commercial farming (sisal, coffee); b) very poor communities; and c) the road did not substantially improve transit.

2) The road has benefited the sale of agricultural products (2 cases): a) type of agriculture - corn, beans and fruit; b) very poor communities; c) minimal socio-economic stratification.

3) Communication was important (2 cases): a) areas affected were very isolated; b) existence of resources such as cattle and fruit.

4) Important changes were initiated (2 cases): a) areas which attract people because of location; b) services exist.

5) The road significantly facilitates commercial intercourse (4 cases): a) rich areas for agriculture, livestock and fishing; and b) located near important economic centers.

6) No classification, because of a drought which has forced the population to migrate (one case).

In all the settlements studied, it was found that families with the greatest resources were the most benefited by the road link between their communities and the rest of the country. However, families with fewer resources were able to improve their economic position and take advantage of the new roads to the extent that their income would allow. Although the construction of the road has produced overall benefits, the differences in relative wealth and poverty remain. In general, these are villages which have already experienced some socio-economic stratification, but increased polarization can also be found in communities which are less differentiated. In the latter, activities which previously were concentrated in the hands of a few are now experiencing greater growth because of the roads and increased commerce. In some places, nevertheless, it was found that the roads benefited some of the poorest families because they attracted prospective buyers of their products and because of the reduced transport costs.

As the analysis indicates, the impact of the roads depends largely

on social, economic and geographic conditions. The extent of communication before the roads, the proximity of an important center, and local resources are all factors to take into account in attempting to evaluate change and above all the rate of change. The course of economic development is largely determined by what productive resources a family has access to. In villages where the improvement of the road opened doors to the intensification of commercial relations, landless families would only benefit to the extent that remunerative work expands. Concerning technology, notable change was observed in the adoption of new inputs, e. g., fertilizers. It is significant that on the average one-third of the families adopted at least one technological innovation; the roads undoubtedly facilitated access to fertilizer. The increased marketing of goods produced by farm families was frequently recorded. Such increase is a good indicator of the accelerated process of integration into the national market of the families surveyed. This process is not new, and can be observed in some degree in the most remote regions of the country; but it is important to note how the improvement of roads can accelerate the process.

The sale of non-agricultural goods and services also underwent some modification in nearly all the settlements. Increases occurred primarily in livestock, and in local trade and transportation activities which reflect a certain degree of prosperity in the families concerned. On the other hand, the discontinuance of handicraft activities implies an improvement of the artisans' economic situation which permitted them to forsake a poorly remunerated occupation. Finally, it was consumer patterns which were the most altered by the opening or improvement of roads, and the increased family incomes. Although in most cases money was spent on food and clothes, some was spent on transistor radios, representing the first luxury article a peasant could afford. The consumption of meat and fish was affected only slightly. In La Calera, where the road construction lasted more than two years, many families bought refrigerators to store soft drinks and beer for selling to tourists who arrived by bus on the new road.

However, the increased income from construction work does not play an important role as a change element in the family economy in the medium term in most cases. The reasons are simple: in the first place, less than half of the population sampled participated in road work; in the second place, those that were working on the road generally did so for less than 6 months; finally, in 60% of the cases the income acquired scarcely reached 2,500 pesos. Under these conditions, one cannot expect a lasting effect from the amounts acquired by reason of the road project. The increased income was nearly always spent on food and clothes, at times on radios, and the latter only in some places - i. e. where the laborers were engaged for a longer time and received more money. There was, however, a certain frequency of investment in land, livestock or small businesses, not all of which is attributable to income earned in construction work.

The socio-economic background of the families which participated in the road project was not similar in all the communities. In some areas relatively poor families predominated; and in other areas, these abstained totally from working. In general, most of the laborers came from the poorest strata. Even though one could consider the road project under the circumstances as a means of income redistribution, the most logical result to expect is that the additional money is spent on instant gratification and will yield minimal effects in the medium and long run. Finally, it may be noted that in order to realize a change in social stratification, more comprehensive socio-economic policies are needed to effect change in the medium and long term.

Analysis of Two Villages

Two villages which were part of the sample under study are examined in more detail. In one of them, El Manacal, changes resulting from the road project were minimal. In the other example, La Calera, the economic changes were notable and contributed to a subtle improvement in the social stratification.

El Manacal is situated on the lower slopes of the volcano Tacana, near the Guatemalan border. The terrain is hilly and the vegetation tropical. This region grows coffee, and enjoys cool weather nearly the whole year. Of the 91 heads of family in El Manacal, 37 are "ejidatarios" (members of the ejido), and the rest are sons of "ejidatarios" who in general do not have rights to land. The Ejido has an area of 300 hectares and is divided into 5 to 10 hectare parcels, on which coffee is grown. Those families which pursue other activities, i. e. trade, transport, or a profession, are generally the more prosperous.

During the coffee harvest there is a large demand for labor in the whole region. Nevertheless, salaries remain low because of the influx of Guatemalan laborers. Even so, landless peasants do not often migrate and remain to work in the region. Until 1974, the "ejidatarios" sold their coffee to the "coyotes", i. e., the middlemen who would come to the village to buy up the coffee. In 1975, the Ejido decided to deliver the major part of its harvest to IMECAFE, which pays better prices but takes delivery in Tapachula. The access road to the village was a disappointment, however, and did not appreciably improve transit conditions.

Life was little affected for the poorest, landless families. Most of the construction jobs went to families of middle and upper income. In agricultural practice: one family began to use insecticide on their coffee (others had done this earlier); another family abandoned the sale of farm animals (increasing their dependence on wage earning). Three transistor radios were bought. Not one of these rather minor changes

can be clearly traced to the road, and in this village the road has for all practical purposes not been a developmental factor. The main reason is simply that the road did not improve transit conditions. In light of this, and because of the lack of flexibility in the productive structure of the community and the families, no appreciable change was discerned in the sample.

La Calera is located in Guerrero state near the border of the Federal District (Mexico City). The climate of the zone is classified as semi-tropical, but the township is in a dry micro-region; the land is level and fertile in season. There are 116 families, of which 80 are ejidatarios and the rest are landless. The ejidal parcels have an average area of 4 hectares, on which is grown sesame as a cash crop and corn for subsistence. Landless families have the opportunity, during the dry season, of leasing some arable land from small property owners of nearby Zirande where there is irrigation. A second important activity in La Calera is fishing, both in the River Balsas and a nearby lake. The fish that is most highly prized is "mojarra", which the Balsas Commission introduced 15 years ago. A few businessmen from Ciudad Altamirano send their trucks to pick up the fish.

The road which now goes to La Calera was only a simple trail before the road project. A bus line uses this road to go from Mexico City to a number of settlements including La Calera. There are four buses a day, and these bus stops generate a third important and most recent activity for the inhabitants of La Calera: the sale of drinks and cigarettes to the passengers and tourists who come to visit the dam at La Calera. Another important innovation for the inhabitants of La Calera is the arrival once a week of a truck selling vegetables, fruit and miscellaneous items.

The difference observed among the landless poor between the families who worked on the road and those who did not is notable. The relatively high income obtained as construction workers made it possible for a number of them to buy refrigerators - some on credit - and begin a small business of soft drinks and beer for the bus passengers who stopped in town. Others expanded their fishing activities, encouraged by a market which was stimulated by tourists who came to see the dam. In this group there were two families who purchased land and developed it using fertilizers, as well as establishing a small business. Of the poor families who did not work on the road, only two bought refrigerators and set up a soft drink stand; one family increased its fishing activities. However, all these families acquired radios, and a few refrigerators were bought for domestic use.

Among the smaller farmers, a few increased their agricultural production, and nearly all the families opened small shops to serve the bus passengers and tourists. This phenomenon was present not only

among the families who worked on the road but also among those who did not. Perhaps this is due to a higher level of income and savings capacity among farmers which facilitated an increased investment in new activities. One family which did not work on the road hired an employee for its expanding family business. The upper income families (with over 5 hectares) bought fertilizers, insecticides and improved seed, and one leased a tractor to work in his parcel. Many abandoned fishing in order to engage in commercial activities. One family employed a clerk for their shop. A member of one of these families began work as a chauffeur for a businessman in Ciudad Altamirano.

It can be seen that improvement of the road and the adoption of the route as a bus line has transformed the life of the town. The bus stop in the town, and the accessibility of the dam of La Calera have encouraged the development of the fishing industry as well as the establishment of refreshment stands which sell soft drinks and beer to thirsty tourists. These businesses do not require a large investment: the sellers of refrigerators and distributors of soft drinks look after their own interest by selling on time, and share the advantages of sudden growth. In addition, the high income enjoyed by a number of families which worked for a long time on the road project permitted many poorer families to participate in the bonanza which the town is enjoying. The inequality which can be observed in La Calera in terms of land tenure did not have the repercussions on income stratification which one would expect due to other options present: fishing, or land leasing in Zirandaro. However, this does not imply complete uniformity among the families: a sesame crop has a high value, and in respect to income source and level the ejidatarios are clearly better off than the landless.

[Extracted from SOP (Secretaria de Obras Publicas) of October, 1975, pp. 22-37. A special issue of the journal of the Secretariat of Public Works, Government of Mexico, Mexico City, in which the contents of a new book are summarized.]

The Trans-Amazon Highway

Eliseu Resende

[In 1970 Brazil initiated a major development effort in its sparsely populated Amazon region, in which new roads are playing a major role. Some of the dimensions of the program, especially the east-west Transamazon highway, are described.]

Brazil's National Integration Program (PIN), enacted in Decree-Law No. 1106, of June, 1970, has the specific purpose of promoting and financing a group of infrastructure facilities in the Northern region surrounding the Amazon river, seeking their integration in the national economy. This program represents the first big step towards the conquest and occupation of the vast area covered by the Amazon forest, which is the biggest unpopulated area in the world with the exception of the polar regions. Brazil's Amazon Region has an area of about five million square kilometers (1.93 million sq. mi.), more than all of Western Europe. This huge territory is largely unsettled, with only about one person per square kilometer.

The exploitation of this immense virgin area has given rise to innumerable studies; scientific missions that have studied it seemed even to get lost in its vastness, producing partial reports that are more descriptive than conclusive. The colossal characteristics of the local nature have frequently led to generalizations that were not always sound as regards the real difficulties of settlement. For example, the hot climate has been accused of being the principal obstacle to the region's occupation. However, local temperatures are not very high; only they do not vary much. As regards topography, contrary to what is supposed, there are not so many flat areas

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afflicted by seasonal flooding; it is difficult to find flooded land beyond fifty miles breadth in the sedimentary areas of the Amazon Basin. The greater part of the land is undulating, though the hills are not high. The soil shows great variations in its characteristics. The higher lands with adequate soil are the ideal areas for permanent occupation. The intensity of rains causes the greatest difficulty - over 80 inches per year, which wash away the soil and would cause gradual wearing away of the dense layer of humus that has accumulated over centuries if a disorderly forest clearing process was begun.

The region has an extensive river system, consisting of nearly 12,000 miles of navigable rivers. The scattered population of the Amazon Region has tended to keep to the river banks, mainly engaging in primary activities as a rudimentary form of subsistence. The inland towns of the Amazon Region are located at the upstream terminals of the navigable stretches of Amazon tributaries. In the process of colonization of the area, the settler entered the unknown region by river as far as he could navigate. From there he went ashore and endeavored to continue by land. These pioneer efforts resulted in the first villages which developed into small towns all clustered on the river banks. Only the continual land access to higher ground more suitable for cultivation, and the overland interconnection of the navigable rivers by means of roads, could encourage man's penetration and settlement in the hinterland.

The building of connecting roads has been a principal activity of the National Integration Program. These roads are supplementing the river system, forming an integrated transport network that would support the colonization of areas situated between the rivers and provide access to the area's wealth. In the first phase, two of the most ambitious projects are the construction of the Trans-Amazon highway, penetrating the Amazon Region from East to West, and the Cuiaba-Santarem highway, inland from North to South. The second phase will include the construction of the Northern Perimeter Highway, the "rim road" intended for opening up the vast area north of the Amazon River. These highway works in the Amazon Region are being financed with funds from the Federal Government's general revenue. The accomplishment of these highway projects is accompanied by a vigorous colonization plan for man's settlement, offering intensive social, technical and financial assistance.

The first major effort to connect the northern region with the populous area to the south was the building of a highway in the late 1950s from the new capital of Brasília to the port of Belém (see map below). In 1970, research was carried out on the economic activities and social conditions of the region affected by the Belém-Brasília road. A comparison of the situation prevailing in 1960 when the road was opened and ten years afterwards appears in the following table, which is useful as a means of appraising the multiplying effect of resources brought about by the highway in areas under development in Brazil.

Table No. 1. SOCIO-ECONOMIC EVOLUTION OF THE AREA OF INFLUENCE OF THE BELEM-BRASILIA HIGHWAY

Aspect under comparison	Situation in 1960	Situation in 1970
1. Population (excluding the cities of Brasília, Anápoles and Belém).	100,000 inhabitants	2,000.000 inhabitants
2. Number of cities and settlements	10	120
3. Bovine herd	Negligible	5,000,000 head
4. Farming	Subsistence	Intensive cultivation of corn, beans, rice and cotton
5. Average daily traffic	Practically non-existent	700 vehicles on the initial southern stretch Anápolis–Ceres–Uruaçu.
		350 vehicles on the remaining stretch up to the Belém zone of influence, when this rate rises considerably.
6. Feeder roads	Non-existent	2,300 km under accelerated construction

Anyone who knew those deserted places on the Goiás Plateau and the Amazon Basin before, would be surprised today at the vitality of the continuous process of settlement and exploitation of the lands and natural resources scattered alongside the 1,327 miles of the Belém - Brasilia Highway.

The Trans-Amazon Highway

In view of the successful experience of utilizing the pioneer road as a great catalytic agent for development, the Brazilian Government decided to launch an outstanding highway project that begins on the Atlantic coast, passes through densely populated Northeastern regions, intercepts the Belém-Brasília Highway, thrusts deep into the tropical forest and reaches remote towns which have stagnated alongside the banks of mighty navigable rivers. After crossing large and fertile valleys it will continue towards the State of Acre, to connect up with the roads linking Brazil to Peru and Bolívia. Its total length, between the city of Joao Pessoa on the easternmost point of Brazil, and the frontier with Peru, measures 5,400 km. The principal objectives were outlined in 1968 and a tentative location line was sketched, aiming at:

-- integrating the Amazon Region with both the Northeast and Mid-south of the country;

-- colonizing the region by using the areas of soil most suitable for agriculture and cattle-raising;

-- providing facilities for exploration and exploitation of the mineral resources found in its area of influence;

-- interconnecting the navigable terminals of the southern tributaries of the Amazon River, thereby uniting overland the remote communities of the region, such as Marabá, Altamira, Itaituba and Humaitá;

-- supplementing the vast river system of the Amazon Region (12,000 miles) to provide access to highlands and their rational use.

The Trans-Amazon can be considered as made up of four sections. The first section, covering 1576 km, crosses the country's Northeast Region between the coast and Estreito, a small town on the Belém-Brasilia Highway (see map). This section of the highway integrated two regions with distinct characteristics; the Northeast is densely populated with a population close to 30 million, distributed mainly on the semi-arid backland called "sertao." The other is the Amazon Region with its negligible population, promising mineral reserves and fertile valleys that are ideal for agriculture and cattle-raising.

The second section of the Trans-Amazon Highway, between Estreito on the Belém-Brasília Highway, and Itaituba on the Tapajós River, has a length of 1,252 km. One of the purposes that decided the location of this stretch was that of making it intercept the Amazon River's tributaries exactly at the upstream terminals of navigation where the principal population centers of the interior of the Amazon Region are located. The road passes alongside the huge iron ore reserves of Serra dos Carajás, already identified as one of the largest in Brazil. Also, geological formations containing copper and lead, as well as manganese, have been spotted along this section. Between the towns of Altamira and Itaituba, the road crosses fertile lands suitable for agriculture. This is the section where the activities of Government agencies are more intensively concentrated to settle man and give him assistance along the areas opened up by the highway. And near Itaituba the two giant penetration roads, the Trans-Amazon Highway and the Cuiabá-Santarém Highway intersect each other at right angles deep in the heart of the greatest forest reserve in the world.

The Third stretch of the Trans-Amazon Highway, between Itaituba and the Porto Velho-Manaus Highway is 1,070 km long. One of the special features on this stretch is the existence of extremely important

mineral deposits. Of major interest are the cassiterite deposits, which are already being prospected and the ore transported along completed parts of the highway. In addition, there are important gold-bearing and limestone deposits. There is also manganese in the Aripuana and Secunduri valleys, long spoken of by Brazilian geologists. The last part of the Trans-Amazon Highway runs between Humaitá on the banks of the Madeira River and the frontier with Peru, a distance of 1,521 km.

The Trans-Amazon Highway is being initially built as a pioneer road, with a 9-meter wide roadway, a gravel surface 7 meters wide, a maximum slope of 9% and minimum turning radius of 30 meters. Land

clearing is being carried out on a 70-meter wide strip, but removal of tree stumps is limited to a central strip 40 meters wide. Small waterways and rivers up to 100 meters wide will be spanned by hardwood bridges: in the beginning, the bigger rivers will be crossed using self-propelling ferries. Improvement of the surface of the road will be gradually undertaken in accordance with the initial investment's returns, gauged in terms of occupation, regional development and generated traffic. In fact, only a few months after completion, clear-cut indications of development have been noted on the Estreito-Itaituba section with an impressive traffic volume.

The construction of the colossal Trans-Amazon Highway project is one of the most important and decisive stages of the National Integration Program. It will be a valuable means of reducing regional economic imbalances and integrating the Amazon Region with the country's economy. Thousands of families from all over the country, but chiefly from critical areas of the Northeast, have shown keen interest in emigrating to new lands available for colonization along the new highway. This has led the Federal Government, through its specialized agencies, to set up a careful selection system in order to synchronize the growing demand for land with actual possibilities of assistance to settlers on their new lands. In the mining sector, the construction of the Trans-Amazon Highway has already stimulated various projects and also provided favorable prospects for wider initiatives. The Trans-Amazon Highway and the development of colonization in its area of influence are already powerful factors for boosting the Brazilian economy, as much on the psychosocial level representing a vigorous compulsion-idea, arousing or multiplying energies, intentions, enthusiasms and encouraging confidence in Brazil's future, as on the physical level through expansion of economic frontiers and the revealing of an immense panorama of opportunities for agriculture, cattle-raising, mining and the extractive industry.

[Extracted from "Highways and Brazil's Development" pp. 12-25, a paper presented to the Seventh World Meeting of the International Road Federation in Munich, Germany, October 1973.]

Brazil: The Amazon Gamble

Vic Cox

[The ambitious thrust of new roads and settlements into the Amazon basin is encountering difficulties, and may be seriously harming the ecology of the region if more care is not taken. But Brazilians are becoming increasingly concerned and knowledgeable on these problems.]

"Brazilians are like crabs," a Brazilian friend told me, "they never leave the coast." He had ample historical support for his simile. Although the idea of an inland capital had been imbedded in Brazilian constitutions since 1891, it wasn't until the mid-1950s that the power shovels began to nose out foundations for Brasilia. But since then the migratory momentum has grown, and by mid-1970s they are definitely on the move. Thousands of settlers are rolling over newly opened land arteries that have begun to web the 1.9 million-square-mile Amazon basin. This vast expanse of arid plain, chaparral and tropical rain forest occupies 60 per cent of the world's fifth largest country. Before the advent of yellow and red dirt roads, the basin had few inhabitants and produced a paltry 4 per cent of the country's wealth.

In 1970 the government decided to try to change all that - the Amazon region was to be "occupied" and "integrated into the Brazilian economy." As the planners saw it, the problem was to direct people away from the confining banks of the Amazon River and into the unpopulated basin where there was room for agriculture, cattle and lumbering. Since Brazil's chronically drought-stricken Northeast had a surplus population - one that was poor, potentially violent and prone to migrating south to urban slums - it was

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a potential source of motivated settlers.

After spending $17 million on aerial mapping and resource indentification across most of the basin, the government launched its road-building program. According to the goals of Brazil's Program of National Integration (PIN), 11,000 miles of roadways, interconnected to 5,600 miles of navigable rivers, are to be constructed during the 1970s. Some of the most important links will be asphalted, as was the 1,200-mile Belém-Brasília highway in 1974. The east-west axis of this ambitious transport network is the almost-completed Transamazon highway, which is slashing 2,500 miles through desert and jungle from the endemically poor northeast to the borders of Peru and Bolivia. Another principal artery still under construction, the North Perimeter highway, will arch across the top of Latin America's largest nation. Two other dirt highways are important for the channeling of immigration. B-165, connecting the Mato Grosso state capital of Cuiaba with the Amazon River port of Santarém, was finished in 1973 and is already carrying heavy traffic and bringing new infusions of capital, entrepreneurial skills and settlers from prosperous southern Brazil. Another life line, BR-080, is now under construction from Brasilia to Manaus, capital of Amazonas state. It too will shorten distances and open markets between the country's developed and neglected regions.

Under the National Integration plan, official colonization follows the highway engineer. The population along the Belém-Brasilia thoroughfare, for example, has burgeoned from a few hundred thousand to 2.5 million since the road was completed in 1960. Today the majority of an estimated 60,000 new families in the Amazon basin are not government-sponsored, but they usually came in over the new roads and many received some form of government aid, such as INCRA registration of their land titles. INCRA, the National Institute of Colonization and Agrarian Reform, was created six years ago to expedite orderly settlement. INCRA's power resides in its ownership of a 60-mile wide strip of land on each side of all federal roads in the basin. However, an institute spokesman in Brasilia told me, "We want the settler to have his own plot of land, and to share other land with the colony. Policy is for INCRA to get in, do the job with its technicians, and get out."

The job is to found viable communities, all theoretically equipped with primary school, health posts, church, bank, warehouse, agricultural assistance and a communication center. To entice people to the forty-odd official colonies in the Amazon basin and the territory of Rondonia in the far west, INCRA recruiters promised transportation to the new towns, plots of land with houses ready, hand tools, some machinery, seeds, medicines and six months of credit. Medical care was to be free, and in the initial phase of road building the men among the colonists were guaranteed work with the construction crews.

Some of the first settlers were flown to the target areas, and for a

number of months INCRA-chartered buses left twice a week from Brasilia, loaded to the roofs with Amazon settlers. Nearly 75 per cent of the colonists were from the Northeast; usually the families carried all their possessions on their backs. But even with the stick of poverty and all the carrots it dangled in front of prospective recruits, INCRA fell far short of its goal. People were reluctant to venture into a disease-infested region that had 265 days of rain a year, averaged 75 per cent humidity, and was nicknamed "The Green Hell." "We thought we could settle 100,000 people a year," the INCRA spokesman said. "Instead we did only 10,000. I'm not telling you a success story; but it takes time to settle a subcontinent. We'll need fifteen or twenty years to evaluate what has been done."

Critics, some of whom originally disparaged the project as linking "an arid desert to a humid one," haven't held their fire. According to one study made for the Ministry of the Interior, nearly 20 per cent of the sponsored settlers have left the colonies. INCRA says it is closer to 5 per cent. A major reason for their departure is that much of the soil along the Transamazon is of low fertility. Once such land is cleared of tree cover by the traditional "slash-and-burn" technique, it can produce only one or two crops before the tropical rains leach the soil of nutrients. Given adequate amounts of expensive fertilizer, the soil could be saved for agriculture. Given adequate resources, INCRA could have fulfilled its promises of medical and technical assistance, and maintained the vital roads. Instead, the institute's budget for the first three years totaled a mere $45 million. Schools weren't built; machinery didn't arrive. Tropical torrents erased whole roads as though they were so many chalk marks on a great green slate. Technicians, difficult to sign up in the first place and spread too thin, have decamped with the disillusioned colonists. It has been like trying to fill a bathtub with a sieve. As a result, the number of government-sponsored new colonists has dwindled to a trickle.

I had time last year to mull over these aspects of Brazil's leapfrogging development during a 600-mile bus trip from Brasilia to Cuiaba. Rolling across the Brazilian central plateau at night you see impressive evidence of widespread rural electrification. The urban centers are still few and far between, but those that exist are bathed after dark in the blue-green glow of mercury vapor street lights. In a way, the gradual replacement of kerosene wick lamps by modern lighting is a comment on how developing nations can skip rungs in climbing the ladder of technological change. The catch is in not knowing whether such a ladder, crafted by the values and experiences of other lands, will support the weight of the borrower's needs. While Brazil can import foreign technology and know-how to solve immediate problems of development, the imports may contribute to other, long-term problems. The planners have opened up the resources and ecology of a "subcontinent" without having a complete understanding of what may happen in the process.

They decided, for example, that half of the land allocated for settlement should remain under tree cover to prevent erosion. Unfortunately, there has been little systematic enforcement of that provision. Nor have the planners followed through with an ecologically sound scheme to coordinate those patches left under cover. The results negate the good intentions. Even worse are the lands allocated to lumbering and cattle interests. Great swaths of forest have been destroyed to make pastures for the tough Brahman cattle, Brazil's equivalent of the Texas Longhorn. As a result, the soil has been exposed to leaching and erosion. The lumber companies, which are legally required to reforest the allotments, have failed to do so, according to on-scene observers. They have descended on the Amazon's timber riches with single-minded dispatch. An estimated million trees are felled in the basin every day, many of them being processed by the thirty sawmills now operating in Rondonia (in 1971 only five mills were operating in the territory). One critic of deforestation, Prof. Marvick Kleer of the University of Riberao Preto, estimates that in the past ten years 24 per cent of the Amazon jungle has been destroyed. He says that if current trends continue the remaining jungle would disappear within thirty years.

Why aren't such warnings from Brazil's small but growing environmentalist movement heeded? Where is the enforcement of the few existing ecology protection laws? To answer that you must return to the roads, listen to the "new pioneers," observe the isolated families living under thatched roofs of long grass and palm fronds, understand that to most Brazilians development means jobs, land, food, health care, means "progress" and a better life.

Brazil is relying heavily on private enterprise, domestic and foreign, to pump infrastructure capital into the Amazon basin. Federal tax incentives allow almost anyone to divert up to 50 per cent of their income tax to government-approved investments in the region. Unlike the practice in much of Latin America, Brazil allows foreign companies and individuals to own rural land, if they develop it. This boon to foreign investors provoked charges five years ago that the Transamazon would open more advantages to outside interests than benefits to Brazil. In any case, the presence of sizable official colonies is evidence of long-term government support for the region and acts as a magnet for private investment.

One other consequence is already apparent: the drive for development has generated new levels of patriotism. Brazilians no longer joke that their nation is "the land of the future - and always will be." Almost like residents in a foreign enclave, many of Brazil's settlers become super patriots. Some 300 miles north of Cuiaba in Sinop, one of the newest colonies established by private companies, the 800 inhabitants recently celebrated their town's official opening with giant banners and brave boasts. "Brazil doesn't ask, doesn't wait; she orders," proclaimed one banner. Another, outside an ice-cream shop, quipped, "We're putting

the pessimists on ice."

That judgment, too, is premature. So far INCRA and the private interests in the Amazon have established a beachhead, not a conquest. But it is evident that the government intends to strengthen its hold on the occupied lands. In December, 1974, the federal executive launched Phase II of PIN by decreeing that during the next four years the government would spend about $143 million annually to develop the basin. Not only is this substantially more money than was allocated in the past, but the investment strategy has also changed. Fifteen areas have been selected for expansion into centers of mineral, forest, agricultural and bovine production. They will be situated in or near INCRA's existing colonies.

This more selective locational strategy will correct the most obvious failures of the preceding policy, but it avoids the most profound problems. The ecologists, and the anthropologists concerned with the impact on indigenous Indian tribes, have raised some of the crucial issues, and they are criticizing the "search-and-destroy tactics" employed in development's name, thus nurturing hopes for a change of direction. The President of the republic, in announcing PIN II, made a statement acknowledging (and minimizing) "dangers . . . to our natural resources." But perhaps the strongest possibility for altering the present exploitation formula lies in the doubts as to its wisdom that are growing among Brazil's planners and technicians.

Attitudes are slowly changing. Brazil is a dynamic country with an inventive, increasingly better-educated citizenry. A number of far-sighted social educators look to the future with confidence. Among them is João de Vasconcellos Sobrinho, a former university rector who, at 66 is one of the few Brazilians who for several decades have promoted ecological concern. In an interview last year with the Brazilian news magazine Veja, Vasconcellos predicted: "The facts will finally lead the planners to the realization that any progress which contradicts ecological laws is really no progress at all." If his optimism is borne out in time, Brazil may find it has a lesson to export that is more valuable than all the riches of its natural resources.

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SMALL BUSINESS

INDUSTRIAL TRAINEE LEARNING ABOUT AUTOMOTIVE PARTS IN A COURSE GIVEN BY SENA (NATIONAL APPRENTICESHIP SERVICE) IN BOGATA, COLOMBIA. (Photo: International Labour Office)

Financing the Development of Small-Scale Industries

IBRD-SIDA Research Team

[The problems involved in promotion and financing of small-scale industrial firms are examined, based on findings from experiences of a dozen developing countries. A strong focus on small firms in policy and resource allocation is needed, and special lending institutions adapted to small-borrower conditions are probably necessary.]

With the increasing demand for the growth of more labor-intensive, employment-generating activities in developing countries, a great deal of attention is being given to the potential of small-scale enterprises as an alternative to larger more capital-intensive firms. In the countries with little industry, there is also a need to find ways of creating an indigenous pool of entrepreneurial skills and an industrial labor force. Thus, a wide range of objectives might be served by assisting small-scale manufacturing and business activity. This study was commissioned to try to distill the common elements of what is needed to succeed in the encouragement of small enterprises. It is based on visits to eight countries - Colombia, Guyana, Iran, Korea, Singapore, Trinidad and Tobago, Tunisia, and Zambia -- and also draws on experience of a number of other developing countries including Bangladesh, India, Israel, Kenya, and Pakistan. The extract presented here summarizes the common financial problems that appear to be universally present in one form or another, and the kinds of solution that warrant consideration by development agencies which want to assist in the growth of small-scale enterprises.

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Surveys in the countries visited, as well as in other countries, indicate that small industries make a very significant contribution to industrial development. Small industries employing up to 50 workers contribute 70% to 80% of industrial employment and 30% to 45% of manufacturing value added in such "industrializing" countries as Colombia, Tunisia, and Iran. In other countries such as Korea, Singapore, and Israel, the share contributed by small-scale units is considerably smaller, but even in these countries they provide at least 20 - 30% of industrial employment and 15 - 25% of value added. In addition, small industries serve as an indispensable training ground for entrepreneurs, managers, and industrial workers.

Essential elements of small-scale industry promotion programs. Small-scale industry programs now figure prominently in the national development plans of many countries, principally because of the alarming proportions of unemployment and underemployment. In Colombia, Trinidad and Tobago, and Tunisia, governments are placing increasing emphasis on employment-oriented policies; and they assume that the encouragement of small-scale industries will increase employment opportunities. The problems created by rapid migration to overburdened urban centers, and sometimes to better job opportunities abroad (from the Caribbean and Mahgreb countries) provide additional pressures for supporting employment-generating activities and providing entrepreneurial openings. The desire to improve the distribution of income is leading to a search for policies and programs which will assist a country's "backward regions." The increased participation of indigenous entrepreneurs through ownership of small-scale enterprises is particularly important in some countries (Zambia, Trinidad and Tobago, Tunisia, Kenya).

In almost all the countries visited, governments state their strong interest in small-scale industry promotion. However, in most of these countries, as in other developing countries where similar objectives are emerging, statements are not always translated into effective action. Even where governments make an explicit effort to promote small scale industries, there has been little overall impact. The notable exception is India, where long-standing central government policies and state programs for financial and technical support have made an impact. In most developing countries, however, the vast majority of small enterprises demonstrate their ability to get started and survive despite rather than because of government activities. There is evidence that many existing firms could substantially increase their productivity and rate of growth, and that new firms could be established in a variety of product lines, if policies were more favorable to small units, or at least not discriminatory against them, and if adequate financing and technical assistance were made available.

An effective program to promote small-scale industries cannot be successfully initiated and implemented unless a government is truly committed to such action. A commitment has to be transformed into

a system of policies and incentives designed to place small enterprises in a position to compete on an equal footing with large enterprises for financial and other resources, and into institutions capable of putting such policies into effect. Programs have to be well-defined and based on a realistic evaluation of the conditions prevailing and the resources available in a given country or region. Given shortages of capital and human resources, an effective program must generally be selective, and commensurate in scale with the means available. To the greatest extent possible, policies should be implemented through a system of incentives rather than by direct government administrative intervention; such intervention has often been ineffective and even counterproductive because of bureaucracy, red tape, and poor quality of staff.

The promotion of small-scale industries requires a centralized high level government unit with a clearly defined responsibility. Such a unit could consist of a special department in a Ministry of Industry (as in Korea), or in a development bank (as in Singapore); alternatively, a special statutory body could be set up (as in Iran). In all cases, however, the unit should concentrate its efforts either solely on small-scale industries, or on small industries as part of a small business program. Its major functions should include: (a) Formulation of policy measures for small-scale industries in conjunction with overall planning for the economy as a whole and for the manufacturing sector in particular. (b) Investigation of discriminatory aspects of existing policies and the formulation of positive policy countermeasures. (c) Furthering the implementation of appropriate policy measures through legislative and/or administrative action. (d) Establishment of institutions to assist small-scale industries, and supervision of such institutions. (e) Initiation of a systematic collection and analysis of data pertaining to small-scale industries.

A small-scale industry policy unit should be headed by a high-level official in a position to influence other ministries. The permanent staff need not be large, but should be of professional caliber. The agency would have to be empowered to commission studies in particular areas; for example, the effects of import regulations, tax holiday, and similar incentives require study in most countries. The importance of policy formulation cannot be overemphasized: one of the major problems facing small-scale industries in all but a handful of developing countries is the actual discrimination of existing policies against them.

Financing Small-Scale Industries

Access to Finance. Only very sketchy information is obtainable with respect to the extent of institutional lending to small enterprises, i. e. lending by private or state banks as opposed to "non-institutional" loans from other sources. Nevertheless, surveys in the countries visited confirm that small manufacturers -- as compared with larger manufacturing

enterprises and with retail traders -- generally face much greater difficulties in obtaining short-term, medium-term, or long-term credit through institutional channels. The nature and extent of these difficulties, of course, varies widely. Small entrepreneurs with established reputations and/or substantial collateral of a type acceptable to local bankers can in many cases obtain some short-term financing from banks, often on the basis of personal promissory notes or against accounts receivable. On the other hand, obtaining bank credit of any kind is extremely difficult for enterprises which are less well established, and in particular for new entrepreneurs. The latter groups constitute the majority of small-scale industrial enterprises in many developing countries; they include cottage industries, artisan workshops, and the most labor-intensive of the small factories.

To an even greater extent than with short-term financing, the use of medium- and long-term bank credit by small-scale industry is generally restricted to the larger and better established enterprises. Even the relatively favored small enterprises whose access to short-term financing is adequate for their working capital frequently encounter severe difficulties in obtaining medium-term funds for expansion or modernization. In at least some of the countries visited (for example, Colombia, Iran, and Korea) this is a critical bottleneck, evidenced by the existence in significant numbers of well established, small enterprises whose owners have the requisite experience to undertake the debt burden associated with long-term investment, but who have insufficient access to the necessary credits. Too often the need for medium-term financing is met by "turning over" of short-term loans, at high cost to the borrower and in violation of sound business practice.

In the absence of recourse to institutional sources, small enterprises in developing countries often depend on credit from suppliers, purchasers, and money lenders. In Korea, for example, small industrial enterprises have been borrowing in the "curb" market at interest rates of 35% to 40% (compared to the maximum "official" short-term lending rate of 17.5%) -- not only for marginal amounts, but, according to some sources, for a substantial part of their credit requirements. In Colombia, small enterprises have borrowed from extra-bank sources at interest rates of 36% to 60%, while the regulated lending rate is around 24%. Often, the smallest enterprises use whatever credit they can get from any source for the purchase of tools or machinery, for repairs or improvements, for raw materials, or to finance sales. Interbusiness and "unofficial" loans are sometimes functionally equivalent to equity financing to the extent that such loans are available for an "indefinite period," and they often involve "silent partnership" with lenders.

Constraints Upon Access to Finance. From the viewpoint of financing institutions, small enterprises are less attractive as borrowers than

larger ones because of their smaller profit potential for the lenders, as well as a variety of administrative difficulties. The profit potential in lending to small-scale industries is less than in lending to larger enterprises because of higher lending costs, greater risks, and the fact that small enterprises typically do not make significant use of the other revenue-yielding services offered by financial institutions such as letters of credit, guarantees, and so on. Moreover, where customer deposits are a major source of bank funds, the borrowing needs of small firms generally yield in priority to those of preferred large depositors. Lending costs tend to be high because small enterprises generally need to borrow only small amounts, while the costs of loan processing have a significant fixed component which is not proportional to the amount loaned. Dealing with inexperienced borrowers requires additional staff time. Risks tend to be greater because small enterprises are typically deficient in equity and acceptable collateral, and because the risk of business failure is relatively high - particularly among new entrepreneurs.

Administrative difficulties in extending credit to small-scale industries arise from a variety of causes. Lending to a large number of heterogeneous and widely dispersed enterprises is intrinsically more demanding of time and effort than dealing with a smaller number of more established and more familiar firms. There are basic problems of contact and communication: in most developing countries few small enterprises are easy to contact at short notice (as for instance by telephone), and many are not conveniently accessible even by automobile. In a number of countries bank personnel are likely to be separated from small entrepreneurs by differences in language, literacy, or culture. Even without such barriers, the personnel of financial institutions are likely to find new small borrowers relatively unfamiliar with documentation and accounting conventions, inarticulate or imprecise in the presentation of business plans, and generally more "difficult" as customers. Small entrepreneurs, for their part, often have difficulty conforming to bank procedures and requirements, especially when lack of proper bookkeeping and record maintenance has prevented the accumulation of required information. Moreover, small entrepreneurs in many countries are often reluctant to provide financial information to credit institutions. The small businessman's fear of "authority" often exacerbates a mutual distrust between him and the banker, making it more difficult for him to cross the social threshold which separates them.

While these kinds of difficulty cannot be fully eliminated, their inhibitory effect on the availability of institutional credit to small-scale industries might often be ameliorated by innovative measures on the part of bank management. Typically, however, neither the inclination nor the motivation for such measures are to be found in the banking systems of most developing countries, although there are occasional exceptions. Successful bank managers generally tend to be conservative in the conduct and supervision of their business operations. Normally they are reluctant to undertake innovative measures in the absence of clear oppor-

tunities for increased profit at acceptable risk, and often prefer to maintain an established pattern of profitable customer relationships with minimum change. Most bank managers in developing countries are not skilled in the art of lending on "book" prospects (an approach required by small companies to a much greater extent than by larger ones), nor aware of the profit potential in doing so. Particularly where loan demand from established, familiar, medium-to-large firms is sufficient to take up under favorable terms and in accordance with routinized procedure the greater part of a bank's loanable funds, there is little incentive to test untried ground by starting to lend to small industries on a significant scale. This reluctance to lend to small enterprises has sometimes been reinforced by restrictive banking laws or central bank regulations, for example minimum value requirements for loans.

The persistence of such inertia is evidenced in the experience of several countries -- including Trinidad, Kenya, and Pakistan -- in which development and commercial banks have been urged by governments to increase their share of lending to small enterprises, and in which matching funds or comparable incentives have in some cases been provided to buttress such requests. Korea provides an exceptional case, where a directive to commercial banks that 30% of their lending be allocated to enterprises employing 5 to 200 workers showed results (although the share reaching the smaller enterprises is not known). In most cases, however, it appears that this type of attempt at persuasion, even when accompanied by incentives, has rarely yielded more than limited results.

Financing needs. The type of credit that small industries generally find most difficult to obtain is long- and medium-term financing. The relatively low labor productivity of small enterprises is often due to a lack of tools, machinery, or building facilities. Small industries are generally unable to raise productivity by introducing equipment if they cannot obtain medium- or long-term financing under reasonable conditions. The provision of loans to finance normal or "permanent" working capital requirements of small enterprises is in many cases as important as the financing of fixed assets. Although most small-scale industries do not have lengthy processing or marketing cycles, they need sufficient working capital to finance basic levels of stocks and receivables. Permanent working capital is also likely to represent a significant problem when the volume of business is expanding. In addition to regular levels of working capital, small enterprises also commonly need short-term loans to finance seasonal or other "peak load" capital requirements.

It would be desirable for small enterprises to rely more on equity capital, both to hold down the cost of interest payments on loans and to confront potential lenders with a more favorable debt/equity ratio and reduce lender risks. But it is probably unrealistic to expect widespread institutional participation in providing equity capital to small industries under small-industry programs. Since this is true, an important aspect of lending programs to small-scale industries in developing countries is the need

for a reasonable degree of flexibility in the construction and administration of amortization schedules. More flexibility is needed by smaller enterprises than by larger ones because the former typically have less ability to forecast cash flow with precision, and less internal control over receipts and payments. Amortization schedules should not be so rigid that they automatically trigger a crisis between the small borrower and the lending institution. A well-designed mechanism for responding to such situations flexibly and without premature recourse to drastic default or collection procedures would probably help reduce the costs of loan administration and supervision.

Experience with Small-Scale Industry Financing Programs

In almost all of the countries visited, specialized arrangements exist to provide financing for small industries. In Colombia and Korea, specialized financing institutions have been established to serve both small-scale and medium-scale industries. A Specialized Artisan's Bank concentrating on small-scale enterprises operates in Israel. Tunisia plans to establish a specialized small industries financing institution. In Trinidad a special division for small-scale industries has been organized within the industrial development corporation. In Zambia, one of the public financing institutions specializes in small business, including manufacturing enterprises. In Iran, Singapore, and Colombia, special funds have been established for disbursement to small industries through institutions not specializing in this type of financing. In Colombia, Tunisia, and Kenya, loans to small-scale industries are rediscountable from a special fund at the central bank. In Iran and Korea, special guarantee funds for small industries have been established.

In several countries (including Iran, Kenya, Korea, and Trinidad), commercial and development banks have been requested by their governments, central banks, or their own boards to increase their lending to small manufacturers. In some cases guarantees, rediscounting facilities, or matching funds have been provided to back up such appeals. There has been some limited success in increasing lending to small enterprises, particularly to the larger and more established of them, through such requests when coupled with incentives. Nevertheless, considering the total amount of lending that goes through these institutions, the overall impact in increased lending to small-scale industries has been marginal in the countries surveyed.

In most countries, special funds for lending to small-scale industries have been provided primarily from the government budget, and to some extent from external loans. In Korea, Tunisia, Colombia, and Trinidad, resources of regular banking institutions provide a significant share of the short-term credit available to small manufacturers. Even in these countries, however, small enterprises face grave difficulties in obtaining medium-term or long-term credits from institutional sources, and most of them remain overly dependent on non-institutional channels. It is true

that some of the countries surveyed have only recently begun to implement their programs. Nonetheless, the limited success of most such programs in achieving even a modest impact must be noted.

Alternative Institutional Channels for Small-Scale Industry Financing

Within the wide range of institutional arrangements and combinations that may be suitable for channeling credit to small-scale industries, the selection of an institutional strategy should take into account the particular patterns of economic, social and geographic factors in a given country or region. There are, for instance, obvious differences between countries in which the primary problem is to increase the productivity or contribution to employment of existing small-scale industries, as compared to those countries in which the most serious problem is the mere lack of entrepreneurs. A most important consideration involves the numbers, kinds, and distribution of existing financial institutions, and the extent to which they have the capability and willingness to participate effectively in promotion of small-scale industry. For practical purposes, the more feasible institutional alternatives can be classified in three basic patterns: (a) those involving a specialized small industry financing institution; (b) those involving a specialized small industry division within an industrial or regional development bank; and (c) those involving a small industry development fund deposited with a central bank or another appropriate agency for re-lending through commercial banks.

Specialized Small Industry Bank. In many cases the requirements of small-scale industries could best be met by a specialized institution whose sole or primary function is the financing of small enterprises. Such an institution would have the advantage of a staff specifically trained in and oriented toward the problems of lending to small entrepreneurs. There would not be the risk of small-scale industries being in practice overlooked or given lower priority than larger ones, as is probable in the non-specialized institutions. Such a specialized bank could design its procedures and policies to adapt with flexibility to the needs of small borrowers, and the latter could find a variety of financial services available in one location with a minimum of red tape.

If such specialized institutions were to provide small-scale enterprises with short-term loans as well as with medium- and long-term financing, they could also be permitted to accept deposits and current accounts from regular depositors. In practice, specialized small-scale industry financing institutions are unlikely to attract regular depositors on a significant scale, particularly at early stages of their development and where they face strong competition from commercial banks. Nevertheless, such institutions might try to attract deposits from small entrepreneurs wishing to establish a banking relationship under which they could receive short-term credit. Even with such deposits, however, funds would certainly be needed from government deposits, or from rediscount

facilities with the central bank. The Artisan's Bank in Israel has demonstrated flexibility; it accepts deposits from the public and lends for short-term working capital needs along with providing medium-term and long-term loans. The Medium Industry Bank in Korea, also a relatively successful institution, similarly provides short-term credits. Both banks had to build up their business in deposits separately from their lending operations, and still do not depend upon small deposits as their major source of funds.

The same functions could also be performed by a Small Business Bank providing finance for all types of small firms, not just manufacturers. The Citizens National Bank in Korea might serve as a prototype for this kind of institution. The shortcoming of this type of bank may be its broad scope, which could somewhat impair concentration on the unique financing requirements of small manufacturers. On the other hand, small countries often cannot afford a multiplicity of institutions each catering to a different type of small-scale enterprise. Moreover, the provision of adequate financing for enterprises engaged in manufacturing-related activities such as transportation, construction, and equipment repair could be expected to have a favorable effect upon the environment in which small manufacturers operate.

A significant difficulty confronting specialized small industry financing institutions, and one of the major determinants of its performance, would be the problem of attracting qualified management and staff. Such institutions might be gravely handicapped by a shortage of competent personnel because they might be less attractive than other financial institutions in terms of staff recruitment, particularly at higher levels. No panaceas can be suggested in this respect: nevertheless, the salaries and other benefits -- including social status -- should be made competitive with those offered by other financial institutions.

Except in the smallest and most geographically compact of the developing countries, another serious problem that would be faced by a small industry bank would lie in the difficulty of servicing small enterprises located outside of the city served by the institution's headquarters office. In Colombia, Israel, and Korea such institutions have established a limited number of branch offices in other major centers, and their experience tends to indicate that such branches can be viable. But while the cost of branch office operations can be lowered as the number of borrowers and the banking services offered are increased, it is obvious that cost considerations, as well as a shortage of qualified staff, would initially limit the number of branches to no more than a few key centers. To reach potential borrowers who would not have ready access to these centers, it would be necessary to utilize commercial bank branch networks, at least for short-term credits. Entrepreneurs seeking longer term loans are more likely to find their way of reaching national or regional offices of the specialized bank.

Specialized Small Industry Division of a Development Bank. A second

feasible alternative for financing small-scale industries is channeling of funds through development banks. In a large number of developing countries, development banks already exist with potential for further expansion in size and scope of operation. Many of them are efficiently managed and have experienced, well trained personnel. They would be in a better position than specialized small industry financing institutions to raise funds from domestic private sources and from external loans. On the other hand, development banking institutions are generally preoccupied with their larger clients or with those smaller firms which are well established and can meet customary collateral requirements. Like commercial banks, they are not eager to engage in high cost lending to small clients. Even if they were to be directed by their charter or by stated government policy toward increased small-scale industry lending, the smaller enterprises might in practice tend to receive lower priority than larger ones.

Many of these constraints upon small industry lending could be ameliorated by the establishment of a specialized division for financing small-scale industries within a development bank. Such a specialized division would need to have the strong support of top management, and to enjoy a high degree of operational autonomy. The responsibility of divisional management would have to be defined solely in terms of divisional objectives, in order to preclude diversion of attention from smaller to larger enterprises. Moreover, such a division would have to be freed from institutional regulations which would restrict their ability to function effectively, such as restrictions with respect to minimum loan amounts, short-term lending, collateral requirement, amortization schedules, and so on.

A division organized along these lines could have many of the advantages of a specialized small industry financing institution, but it would also face many of the same problems, most notably in the areas of staffing and branch operations. Private development banks (i. e. development finance companies) are unlikely to voluntarily establish such a division; public or mixed development banks may well require special government treatment in order to do so.

Small Industry Fund for Lending through Commercial Banks. A third alternative would involve a small industry development fund deposited with a central bank or other appropriate agency for re-lending through commercial banks. The effectiveness of such an approach would depend primarily upon the extent to which the commercial banking system of a given country is willing and able to function proficiently within the context of an overall small-scale industry financing program. In many developing countries, commercial banks would have significant advantages as intermediaries for channeling credit to small-scale industries. Typically they have relatively large and competent staffs, and often extensive branch networks offering widespread geographic coverage. They are capable of offering various types of loans. Their branch

systems can help reduce -- on "marginal pricing" grounds -- the extra administrative costs associated with lending to small enterprises. On the other hand, they are probably more sensitive than other types of financial institutions to the constraints upon small industry financing. For this reason, commercial banks could serve as effective intermediaries for small-scale industry financing only if they are offered sufficient motivation, and are provided with sufficient guidance in the unique problems of lending to small enterprises.

To motivate banks to serve as active agents, they must be offered a commission or margin sufficiently large to permit profitable operation. The size of the required margin would, of course, depend upon the actual level of administrative costs and default risks assumed by the banks; it could be significantly reduced if most of the default risks were underwritten by a guarantee fund or similar arrangement, as suggested below. The natural tendency of branch credit institutions to minimize administrative costs by concentrating upon larger loans to more established small enterprises might be mitigated by supplementing the margin by payment of a reasonable fixed fee per loan processed, with the size of this fee unrelated to the amount loaned.

Interest Rates for Borrowing and Lending

A major issue in small industry financing is the rate of interest charged to the final borrower and its relationship to the supply of credit, on the one hand, and to the cost of credit to the financial intermediary on the other. In dealing with this issue, a distinction needs to be drawn between the "absolute" level of interest actually paid by small industry borrowers, and the "relative" level of interest rates charged by institutions to small enterprises in comparison with those charged to larger firms. The absolute level of interest paid by small industries would necessarily vary according to economic and financial conditions prevailing in a given country -- its stage of development, supply and demand conditions for credit, rate of inflation, and so on. Generally, the provision of adequate financing from institutional sources would help reduce the overall cost of credit to the small entrepreneur by reducing his borrowing from non-institutional sources at very high interest rates.

The relative rate of interest charged by a financial institution to small industrial enterprises in comparison with those charged to larger enterprises is affected mainly by lending costs. The cost of lending to small enterprises tends to be higher than the cost of lending to larger ones; other things being equal, higher lending costs would require a larger spread between the rate at which the financing institution obtains its funds and its lending rate. The actual spread required by financial intermediaries for lending to small-scale industries would depend on the range of services provided and the operating efficiency of the institution. Available experience is too scanty to provide a basis for sound generali-

zation as to the required spread, but a few examples suggest a plausible range of 4 to 6 percentage points. At institutions visited, the spread on medium- and long-term loans ranged from an exceptional low of 2.5% at the Medium Industry Bank in Korea, to about 4% at the Artisan's Bank in Israel, to 5% in one Iranian program. This compares with a spread of 1.5% to 3% charged by many development banks in lending to larger enterprises, according to World Bank data.

If financing institutions lending to small-scale industries were provided with funds at interest rates comparable to those at which development banks typically obtain their funds, the higher spread required for lending to small enterprises might result in an interest rate to the final borrower some 2 or 3 percentage points higher than the rate generally charged by development banks to larger enterprises. Although such a differential in interest rates is not socially desirable and may be vulnerable to political objections, it might be tolerable provided that institutional financing in sufficient quantity is made available to small-scale industries. If the problems faced by small enterprises in obtaining access to institutional financing can be overcome, then the effect of such a differential upon their financial viability is not likely to be very significant. The vast majority of small-scale industrial enterprises currently pay for noninstitutional finance at interest rates several times higher, and have only negligible access to any type of institutional credit.

A government (or external) subsidy to cover all or part of the differential cost of lending to small-scale industries might perhaps be justified on the grounds of differential contribution of such industries to employment and/or entrepreneural development. However, there may be a danger that such subsidization applied to a limited supply of lending capital could actually reduce the volume of financing or other assistance available to small-scale industries. Where there is a significant trade-off between the amount and the cost of institutional credit for small enterprises, priority should generally be given to the supply of institutional financing in sufficient quantity rather than to the equalization of interest rates charged to different types of enterprises.

Risk Assumption and Guarantee Arrangements

Another major problem related to financing of small-scale industries on a significant scale is the risk element involved, particularly in lending to newer and/or smaller entrepreneurs. Based on experience in the countries visited, guarantee arrangements are generally required on loans for small-scale industry and particularly for long-term financing. Lending on a significant scale to very small enterprises which generally lack sufficient collateral, and in particular to new entrepreneurs, might involve risks too high to be borne by financing institutions themselves without endangering their financial stability and soundness. The institutions specializing in lending to small enterprises in Colombia, Kenya,

Trinidad, and Zambia have experienced high default rates on their loans. This was partly due to poor follow-up, and sometimes to irregular lending which led to an unnecessarily high incidence of default; but the problem exists - both in substance, and in the attitudes of the banking community. Risk assumption is thus particularly important in broadening the sources of credit for small enterprises.

In the absence of guarantee arrangements, both specialized institutions and commercial banks would have to be conservative: the smallest and financially weakest enterprises are unlikely to receive sufficient credit if the institutions are to avoid losses. To encourage innovative lending practices, particularly to new entrepreneurs, a guarantee arrangement is required. The share of a loan covered by a guarantee might be high, perhaps 80% to 90% in the early years of a small-scale industry lending operation, but should not cover 100% of the loan. After the institutions have gained experience and confidence in loan evaluation, the guarantee coverage could be gradually reduced. Special arrangements might be required to cover the risks of a specialized small-scale industry financing institution, as compared to those of more generalized institutions lending to small-scale industries. Initially, and probably for an indefinite period, most of the risk involved in guarantee arrangements would have to be borne by the government. In fact, the willingness to undertake such guarantees could attest to the actual seriousness of a government's expressed intent to promote small-scale industry.

Auxiliary Activities

Equipment Rental. As a supplement to conventional loans for acquisition of fixed assets, equipment leasing or hire-purchase arrangements may be a suitable financing technique in some countries. Leasing of equipment, as compared to its outright purchase with borrowed funds, has several potential advantages for small enterprises in developing countries. First, it could mitigate the problem of financial security for loans -- a problem that is likely to remain salient among many bankers in developing countries despite efforts aimed at inducing them to lend more on the basis of "book prospects" and less on the basis of collateral. Second, lease contracts can, within broad limits, be tailored to the circumstances of individual small enterprises. However, the concept as well as the contractual procedures involved are usually unfamiliar, both to institutional staff and to the small entrepreneurs; and cultural or historical factors may predispose many entrepreneurs to prefer formal ownership of equipment over availability for use. Leasing companies are not prevalent in most developing countries, but their entry might be encouraged. There is some precedent for the establishment of leasing companies as subsidiaries or divisions of commercial banks, and some development banks might be willing to engage in similar operations. Moreover, some equipment manufacturers in developed countries main-

tain extensive leasing operations of their own, and might under appropriate circumstances be induced to expand their international operations. This latter type of approach might be particularly suitable (and attractive to manufacturers) if maintenance and repair aspects of the operation could be coordinated with technical services institutions.

Technical/Managerial Services. The promotion of small industries will be more successful when financial support is accompanied by technical assistance and managerial advice. Two basic types of technical/managerial services are typically needed by small industry in developing countries: (a) extension services capable of providing rather general advice on operating small industrial enterprises, concentrating largely on management procedures and techniques (e. g., bookkeeping) common to a wide range of varied enterprises; and (b) specialist technical services concentrating on the unique problems relevant to different specific types of industrial activity. Both these types of assistance are necessary, and they are complementary: the extension-type approach is particularly useful at earlier stages of industrialization. The more industrialized a country becomes, the more the emphasis should shift to provision of specialist services.

Generalist extension services for small industries are in some ways analogous to agricultural extension programs. The individual extension worker, operating largely "in the field" and with the relatively high degree of autonomy required to deal with a variety of widely diversified problems, would be crucial to the success of an extension program. To provide effective support he would have to be a "generalist" capable of identifying a variety of common problems and providing general advice for coping with the basic financial and management functions. Services provided should be relatively simple and applicable to the actual needs of the very small enterprise. At least initially, the extension worker might well concentrate on reaching the small entrepreneur at his place of business, working with him in his own familiar environment. Such extension workers might be recruited from among graduates of middle-level vocational schools, or from former owners or managers of small enterprises. Technical/managerial service centers should experiment in short-term training or refresher courses for extension workers.

The generalist extension worker would, of course, require access to sources of technological and/or professional back-up. This back-up might well be provided by a central or regional institution serving as a training and research center for small-scale industries. It could provide specialists in particular areas, conduct courses in management and production methods, and operate demonstration workshops. Such an institution could be expected to operate effectively only in one locality or a small number of places, but its resources would be made available through the extension agents to small enterprises at the local level.

The cost of extension services are bound to be high. Data available

on such services in countries visited, for example Iran and Singapore, indicate a high cost per enterprise receiving such assistance. Further experience and some standardization of operating procedures on the basis of a large network might indicate whether costs of services can be significantly reduced by increased volume. In any case, a technical service would almost certainly have to be supported from budgetary sources (even if technical/managerial services are provided by a financing institution, they would have to be subsidized). The small enterprise could be charged a nominal fee for regular services provided by the extension generalist. Such a fee might be useful in enhancing the perceived value of the service to the entrepreneur, although it would not cover much of the cost of the extension service. More advanced entrepreneurs would require more specialized accounting, legal, engineering, or management consulting services, which could be provided by headquarters staff of the technical services institution or by other sources. The entrepreneur might reasonably be expected to bear most, or even all, of the cost involved when such specialist services are provided.

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Finance vs. Advice in Small Business Promotion

Malcolm Harper

[Small-scale businessmen everywhere believe that their most pressing problem, if not their only one, is lack of finance. Organizations devoted to the promotion of small business have come to believe that finance must be accompanied by management advice. Such advice should precede any consideration of financial assistance: this would not only improve the chances of effective use of additional finance but it may show that there is in fact no need for more capital at all. A case of need for advice rather than loans is described.]

It is perhaps to be expected that small businessmen will tend to attribute their difficulties to a lack of funds, that is, to circumstances which they believe to be beyond their own control. Nobody likes to admit to lack of knowledge of any sort. Most writers and authorities on Africa seem to be in general agreement that businessmen themselves believe their major difficulty to be their shortage of finance, whether the authors agree with them or not. In Ghana, Egypt, Nigeria Tanzania and Kenya the conclusion is the same. Even at the other extreme of development, namely the United States, we are told that the belief is identical.

It may be that the researchers are being somewhat naive when they take this assertion of belief at face value. Small businessmen are no less shrewd than mankind in general. An apparently sympathetic observer, usually from another level of society, is unlikely to be able to solve a problem of shortage of competent and honest staff, or of insufficient customers. He is likely, however, whatever his disavowals, to be a link with a source of funds; and, like any patient, the small-scale

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businessman will emphasize those problems which he believes the supposed practitioner may be able to cure. Nevertheless, the unanimity of opinion is such that it is probably reasonable to state that most small-scale businessmen do believe that their most pressing problem is shortage of finance.

Small business is generally regarded as something to be encouraged, and this is not only in developing countries where almost any sort of economic activity is welcome. In the United States and Western Europe small-scale businessmen are regarded as particularly deserving of government assistance. Many of the pioneering efforts at small business promotion started by accepting the businessmen's own assessment of what they really needed. Subsequent experience showed that finance on its own was often wasted or even counterproductive.

Commercial banks have traditionally made loans on the basis of the security that is offered. They then progressed to assessing the managerial ability of the borrower, and the viability of the project for which the loan was intended. The cost of assessing the value of securities, managerial ability or project viability does not vary very much with the amount of money involved, so that economies of scale alone have prevented banks from becoming heavily involved in small business financing. This is one reason why governments have become involved in this activity. It is natural and reasonable to progress from attempting to assess managerial ability to trying to improve it, or even create it when it is absent. Initially such efforts were made in order to salvage a loan that should never have been made, but it was clearly better to include management advice as part of the loan package in order to minimize the risk of loss. Small business financing organizations have sometimes gone beyond this, to the stage of insisting on some sort of management training as a formal or implied condition of granting a loan at all.

Even at this stage in the development of ideas about how to promote small business, the loan, or other form of provision of capital, is still seen as the goal of the institution. The ultimate goal is obviously the development of small business activities, but this is a difficult standard by which to measure. The result is that the preoccupation with lending money often leads to such organizations being judged by the standard of how much money has been lent to how many small businesses. Politicians or aid agencies can point proudly to a rising curve in the amount or number of loans which have been made, as almost any issue of a daily newspaper in a developing country will show. The amounts of money spent on management training, or the number of businessmen who have attended courses or received advice, are less impressive. It is as difficult to analyze properly the costs and benefits of lending as it is of education or training. From a political or public relations point of view, however, sums of money

which have been lent to small businesses can be presented as being wholly beneficial to them and thus to the nation. Lending can thus more easily be justified and is politically attractive.

An attempt has been made to check the validity of the general belief that capital shortage is the major constraint on small business development. This investigation was a byproduct of a project designed to test the value of a simple consultancy procedure for small-scale shopkeepers in Kenya. The procedure is intended to provide a solution to the difficulty of staffing small business extension services. Such services are generally considered to be necessary, but have rarely been fully implemented because of the economic and practical difficulty of recruiting and paying staff of the qualifications and experience that are normally thought necessary. A simple consultancy procedure has been devised whose purpose is to enable staff with only four years secondary education, and no business experience, to give useful individual advice and training to shopkeepers on their own premises. If this can be shown to operate effectively it may permit the employment of lower level staff (i. e., paraprofessionals) who are more willing to work in rural areas, and are readily available at moderate cost in most developing countries. The first stage of the procedure involves the construction of a set of accounts for the business. This consists of simple balance sheets, listing the resources of the business, how they are being used and whence they have been obtained, and a monthly profit and loss account showing how the pattern of resource application is used over a period. The primary purpose of these accounts was to provide a basis for useful individual advice; this financial picture of a business, both as it stands at a particular moment and how it operates over time, is essential for useful evaluation. Any investor, lender or consultant would request such information before making any more qualitative enquiries, and certainly before committing any funds or making any practical recommendation.

Sets of accounts for approximately one hundred small rural provision shops in Kenya were collected in this way. General provision shops, as opposed to small industrial enterprises which are the more usual target of small business promotion efforts, were chosen because there are larger numbers of them and they provided a more replicable testing ground for the consultancy procedure. The same method has however been tested on carpenters, metalworkers, vehicle mechanics, bakers and tailors, and the results are generally similar to those recorded for shopkeepers although the samples were of necessity far smaller. The information given was certainly approximate, but it was often possible to cross-check doubtful figures. In most cases guesses by either the consultant or the client have been substantiated later when records have become available as a result of the advice provided. Summary and analysis of the 100 sets of accounts provides some useful data on the actual importance of the alleged shortage of capital.

In order to check the shopkeepers' own perception of their major difficulty, they were asked what they considered to be their most pressing problem. Sixty-two per cent identified their shortage of capital or difficulty in obtaining a loan as their major problem, and a further 28 per cent mentioned their shortage of stocks or customers which they themselves attributed to their lack of capital. Analysis of the asset side of their balance sheets, in relation to monthly sales and expenses, revealed some interesting relationships which indicate that capital shortage may indeed be illusory in a majority of cases. One of the few management guidelines which is consistently preached to small-scale businessmen is the danger of granting excessive credit to their customers. They themselves seem aware of this danger, but nevertheless this was clearly the first place to look for an uneconomic concentration of assets. Rather surprisingly, 80 per cent of the shopkeepers were owed less than the value of two weeks' sales. Such an investment in debtors is very low by any standard, and would hardly qualify as a substantial misallocation of resources.

Another use of capital which should perhaps be avoided by aggressive entrepreneurs is investment in land and buildings. If a businessman has three-quarters or more of his total capital tied up in his premises, it is arguable that he is not making the best use of his resources if there are in fact suitable buildings available to rent at reasonable rates. This is a contentious argument, but in any case less than one third of the shopkeepers owned the buildings where they carried on their business, so that this misuse of capital, if in fact it is one, is not particularly significant. Cash, and bank balances if any, are usually barely sufficient for the day to day operation of the business, considering that trade credit is only occasionally extended to small-scale African businessmen so that nearly all supplies have to be bought for cash. Fixed assets and equipment such as weighing scales or shelves offer few opportunities for ill advised utilization of funds.

The only remaining asset is one whose insufficiency the shopkeepers themselves often claim to be one of their main problems. This is the stock or inventory of goods available for sale. Customers also will agree that certain goods are indeed frequently out of stock, so that this might at first sight appear to be an asset in which more money rather than less should be invested. Analysis of the one hundred rural Kenyan shopkeepers' accounts indicates, however, that the investment in stocks, in total, is usually more than it need be. Thirty-four per cent of the shopkeepers had two months' or more worth of goods in stock. A further 50 per cent had between one and two months' worth of goods in stock, so that only 16 per cent had less than one month's worth. If opportunities for restocking were widely spaced, or the minimum quantities of goods which had to be bought to benefit from wholesale prices were sufficient for several months' sales, this slow turnover of stock would be understandable. As it is, however, all the shops

in the sample were within easy reach of wholesale suppliers, who often delivered goods to them. Most of the shopkeepers restocked every week or more frequently, and none bought their supplies less frequently than once a month. Suppliers are generally very sensitive to the capital constraints of their channels of distribution as well as their final consumers. In the same way that most branded provisions are packed in tiny multiples so that customers need only buy enough for one day's use or less, similarly the outer cartons are made up in multiples that are designed to avoid straining the resources of retailers. If neither the infrequency of restocking opportunities nor the size of minimum purchases can adequately explain the high level of stocks, how can it be accounted for?

Inspection of the actual goods usually reveals that certain staple items, such as salt or sugar, are, as customers complain, either frequently out of stock or dangerously low. On the other hand there are many months' worth of other items, or even stocks which will in all probability never be sold, so that the average stockturn comes to the figure already given. In some cases, it was possible to record and value the stock at the beginning and end of a month, and to keep a complete record of all purchases made during the month. In this way it was possible to analyze the stocks by product type, gross margin and stock value. A summary of the results of this analysis is as follows:

TABLE 1

Product Group	% of total gross margin contributed by group	% of total stocks devoted to group
Staple foods; sugar, salt, flour, rice	20%	20%
Other foods; canned goods, soft drinks, flavors, baby foods, fats and oils, etc.	22%	42%
Cigarettes	2%	1%
Soaps and detergents	21%	17%
Non food items; pens, medicines, trinkets, paper, scarves, etc.	35%	19%
	100%	100%

Cigarettes are shown separately in this analysis because they are by far the most easily available of all product groups, and yet are the most often out of stock. The monopoly supplier has organized a most effective, and expensive, system to ensure that nearly every shopkeeper is with-

in easy walking distance of a stocking point. The result has been chronic understocking, presumably because shopkeepers feel that the convenience of supplies means that they can afford to run out of stocks for frequent short periods. In most of the shops, at least one of the staple items was not available; shopkeepers explained that they had not the necessary cash to buy the whole sack which is usually the minimum multiple available at wholesale terms. At the same time 42 per cent of their stocks, in money terms, were held in non-essential foods, usually branded and aggressively promoted to shops as well as to final consumers. In spite of such promotion, the sales of these items is not sufficient to justify the heavy commitment to stocks, particularly when this commitment prevents the stocking of staple items whose absence discourages customers from making any purchases at all.

Every businessman, whatever his training and experience, runs the risk of buying or manufacturing goods which are not suitable for the market, and there is no reason to suppose that Kenyan shopkeepers are more liable to mistakes of this sort than anyone else. The problem lies in the reluctance to recognize the mistakes for what they are, and thus to liquidate the excess stocks. As time goes on the accumulation of slow moving stocks constitutes an ever increasing proportion of the total, so that eventually a business with a more than adequate stock level in total financial terms will grind to a halt because there is nothing in stock that people want to buy. A totally unsophisticated retailer may be tempted to stock only the slower moving goods, because they generally yield a higher gross margin when they are sold. This extreme case does not often occur, because some staple items are recognized as being desirable whatever their markup. Staples are however regarded as a necessary evil, and the meager markup in percentage terms is further reduced by the inevitable wastage involved in repacking, and the cost of the newspaper and gummed tape or whatever packaging material is employed. As time goes on therefore, and buying mistakes are not recognized as such and corrected by disposals, an increasing proportion of the total stock is taken up by slow moving goods.

Small retailers in rural Kenya are certainly operating in a highly competitive environment. The majority of the shops are located in markets with up to forty or more similar traders, all selling the same goods to the same customers. It might therefore appear that overstocking of the sort described would be effectively eliminated by competition. There is certainly a high turnover of businesses in rural markets. One quarter of the shops which were studied had been established for less than twelve months. Poor stock management certainly contributes to the high failure rate implied by the large numbers of new shops. There is however a definite tendency for the longest established shops also to be those with the slowest rate of stockturn. Most shops are initially established with too few stocks to sustain a level of sales which will give even a marginally tolerable return to the owner. By a combination

of luck, hard work and perhaps a flair for business some overcome the handicap of initial undercapitalization; but they only survive because the owner reinvests all, or nearly all, the profits. This reinvestment brings the stocks up to a reasonable level in relation to sales, but the habit of frugality and regular reinvestment in stock regardless of customers' needs means that the total of stocks continues to rise beyond the point where such increase results in any increase in sales. Very few small retailers in Kenya have any idea of their profits; the most reliable indicator of success, and one which is obvious to his customers and his peers as well as to the shopkeeper himself, is heavily stocked shelves. In many cases, therefore, a slow rate of stockturn is the likely outcome of the good management that ensured the original survivor of the business, and is thus not wholly irrationally perceived as a sign of continuing good management.

Larger distributive organizations, who are faced with a number of alternative stocking opportunities, a range of prices dependent on the quantity bought, and volatile price levels depending on seasonal or other factors, use sophisticated techniques for deciding what to buy, and the economic quality. But a small general provision retailer in rural Kenya is usually dealing with a given, and to his mind inadequate, amount of capital when making a buying decision. He is concerned only with what to buy for a certain sum of money, and not with how much money he should spend. His opportunity cost of capital is for practical purposes irrelevant. The only data in addition to the gross margin that is required to enable such traders to deploy their funds more efficiently is some estimate of the time taken to sell a given quantity of each item under consideration. Shopkeepers are, in practice, able to make such estimates. If they can be taught to use this information the benefits will be two-fold. First, their return on capital will be improved; ultimately it may become evident that customers' needs can be satisfied with a smaller investment in stocks than was previously thought necessary. The surplus may then be invested in agriculture or in some other asset which is more productive than tins of baby food gathering dust for years on a shelf. Secondly, the customers themselves will be able to buy what they need. It is true that the purchasing power of the rural population is limited, and the small market is a very powerful constraint on the development of profitable retailing in rural areas. On the other hand, the existing limited requirements are not being satisfied. An attempt was made to assess customers' opinions of the service they obtained from rural markets. The results indicated that adequate stocks are a major deficiency in the eyes of the customers, and a more frequent source of complaint than the lack of cleanliness, polite service, or convenient hours.

The availability of sufficient funds in total, tied up in slower moving items, also means that the deficiency can be remedied. A comparison with stockturn figures for other retail organizations indicated that it is

certainly possible to satisfy a far wider range of customer requirements with a smaller investment in stocks in relation to turnover. Analysis of the published accounts of ten major retailing organizations in the United Kingdom, selected at random, showed that their average rate of stockturn was eleven times a year; only one had as much as six weeks' value of goods in stock, and many had less than a month. Small well-managed food retailers in the United Kingdom are said to aim at less than two weeks' value of goods in stock. The average figure for the rural Kenyan general provision shop was two months.

Fortunately, this particular form of misallocation of resources can usually be remedied fairly easily, using the same techniques adopted by the large retailing organizations. It may be possible to sell the goods at a special price which still covers the buying cost, and several of the retailers in the sample under investigation were persuaded to do this. They disposed of the slow moving items, so that funds were available for investment in goods that were in demand, and in addition the bargain offered attracted more customers into the shop, who bought other goods as well. Suppliers are sometimes willing to exchange slow moving goods with others of equal value, and they may be given away to customers to encourage regular purchases. The difficulty lies not so much in the actual method of disposing of the goods, and thus releasing the funds. The shopkeeper must be brought to realize that stocks of this sort are valueless until they are turned into money, and that a reduction in prices is not a loss.

The concept of the profitable use, as opposed to the possession, of resources, is fundamental to progress in many fields. This concept involves an important change of attitude. Possessions confer status, and the extended family system often involves such a drain on financial resources that there is a considerable disincentive to the possession of assets which are obviously highly productive. An individualistic shopkeeper may not wish to resist the claims of family members overtly, but if his wealth is tied up in stocks of goods which are unlikely to be sold, he is in a better position to deny assistance than if he has a substantial bank account or large stocks of goods which can obviously be quickly turned into money.

In agriculture, attitude changes of this sort are usually introduced by repeated farm visits by extension officers, combined with demonstration plots and other forms of group instruction. Improved stock control, the disposal of slow moving items and other retail management techniques cannot be demonstrated as easily as the proper cultivation of a new crop. The threat of competition also makes demonstration, or any other group training such as courses, rather difficult to organize. Shopkeepers and other traders are aware that one man's success is often obtained at the expense of another man's failure, whereas it is almost always true that success by one farmer with a new crop or

other innovation is likely to help his neighbors to do the same. The role of individual extension thus becomes even more critical than in agriculture. The most effective form of demonstration is the guided and successful implementation of an improvement on the business itself. It is hoped that the experiments referred to earlier will make it more feasible and economic to implement the extension services which are so often recommended for small-scale business in developing countries.

Most small businessmen believe that shortage of capital is their major difficulty, and thus that a loan will solve all their problems. If an extension service is provided by an organization which is perceived primarily as a source of loans, its clients may follow the advice only insofar as they believe that compliance will improve their chances of obtaining a loan. The courses which are presently provided for small shopkeepers in Kenya by the District Trade Development Officers suffer from this problem, because the same officers are also the representatives of Government lending activity in rural areas. The businessmen who receive advice and training must believe that the ultimate purpose of the service is the improvement of the performance and profitability of their businesses. If they can be shown how to make better use of their existing resources, and can be trained to use them more effectively in the future, they will be able to generate the capital they need from internal sources, and also to make better use of loans when they are considered appropriate.

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Small Enterprises and Sub-Contracting in Japan and India

Susumu Watanabe

[The encouragement of small enterprises in India by means of subcontracting is examined here from a Japanese perspective. The success of Japan in mobilizing small firms in its industrialization has attracted interest, especially in India, but the subcontracting method cannot be transplanted under inappropriate conditions.]

Development planners are wont to seek support and justification for their proposals in the experience of other countries where similar practices have worked well. However, the success of these practices is often inseparable from a country's social and cultural background and the mentality of its people; the extra cost of grafting them on to another country's economic system can seriously impair their advantageousness. Neglect of these important facts seems to have caused a frustration of development plans and waste of resources. This is particularly evident in the policies for promotion of small manufacturing enterprises and industrial subcontracting in India. Advocates of these policies usually cite the example of Japan, where small enterprises and industrial subcontracting undoubtedly played (and are still playing) an important role in the economy's rapid industrialization under conditions of surplus labor and shortage of capital. Probably nowhere else in the world have policy makers shown such interest in this aspect of the Japanese experience as in India. Under the constant and growing pressure of mass unemployment and poverty, and under the influence of Gandhian ideology, the Indian Government emphasizes the role of small enterprises and subcontracting ("ancillary industry" in the Indian terminology) in the belief that they are effective

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means of employing more labor and saving capital, and will also counteract the concentration of industrial ownership and make for balanced economic development of the different regions of the country.

Empirical studies in India, however, often conclude that for a given amount of capital the employment potential of small-scale enterprises is not substantially different from that of large-scale enterprises or that employment generation by means of the former is very costly. To some extent, the divergence of opinion is due to differences in data. For example, the Annual Survey of Industries in India does not cover enterprises with fewer than 10 workers using power, or fewer than 20 not using power. Critics sometimes generalize from these very small enterprises, or look only at newly established enterprises whose coefficients are naturally different from those of old ones. Also, the Government of India defines a small enterprise in terms of capital investment (under Rs. 1 million in the case of subcontractors irrespective of the number of employees), whereas non-official authors usually discuss the matter in terms of the number of workers. The Government's definition will naturally tend to lower the capital/labor ratios of "small" enterprises by excluding those using a lot of capital but employing few workers. Important as the statistical inconsistencies undoubtedly are, there are more fundamental causes of the controversy. I will attempt to examine briefly the differences in the capital/labor, capital/output and output/labor ratios in Japanese enterprises of varying sizes, and to discuss some neglected aspects of the Indian approach to small enterprise promotion which may have made the process unnecessarily expensive.

Differences by size of enterprise

Capital/labor ratio. If Japanese manufacturing enterprises are classified according to the number of workers they employ, the amount of fixed capital assets per worker is found to reach its lowest point in the third smallest size group (i. e. 10-19 workers), after which it starts to rise again (middle curve in Figure 1). The fact that this ratio is higher in the two smallest size groups can be explained by the larger proportion of buildings and land in their fixed capital assets: in 1966 these two items accounted for 63. 5 per cent and 51. 5 per cent of the total in the smallest and the second smallest size group respectively, as compared with 47. 8 per cent in manufacturing as a whole. If these two items are excluded the amount of fixed capital per worker rises steadily from the smallest to the largest size group, as indicated by the lower curve in Figure 1. The values attached to the buildings and land of the smallest size groups, moreover, cannot be exact and appear to be overstated. A large number of small Japanese enterprises use part of the entrepreneurs' residence as their workshops (73. 5 and 29. 1 per cent of the two smallest groups), and they do not distinguish business expenses from household expenses.

Smaller enterprises generally tend to be less capital-intensive than larger ones, particularly in heavy industries producing petroleum products, iron and steel, paper and pulp, chemicals and non-ferrous metals, as well as in ceramic, stone and clay product manufacturing. The tendency is not so obvious in most of the light industries. In furniture and fixture manufacturing, the largest size group appears to be considerably less capital-intensive than the smallest. In industries which produce clothing, electrical machinery, precision instruments, rubber products, leather products, printed products and textiles, no great difference is apparent at least up to the 200-worker level. (Note: in the original article appendix tables give ratios for industry groups.)

Capital/output ratio. With respect to manufacturing as a whole, the capital/output ratio falls sharply as the size of enterprise grows until the floor is reached with the 20-49 worker group (upper curve in Figure 2). The difference is small, however, between enterprises with 10-19 workers and those with 200-299, and the ratio is still lower in the largest size group than in the two smallest groups. This tendency is particularly noticeable in light industries, while the ratio increases sharply in the largest group in some heavy industries. The extremely high capital/output ratio in the smallest group is again largely a result of the relative importance of buildings and land. If these capital items are excluded, the differences are smoothed out as illustrated by the much flatter lower curve in Figure 2.

FIGURE 1. FIXED CAPITAL ASSETS AND GROSS ANNUAL VALUE ADDED PER WORKER IN JAPANESE MANUFACTURING BY SIZE OF FIRM, 1966

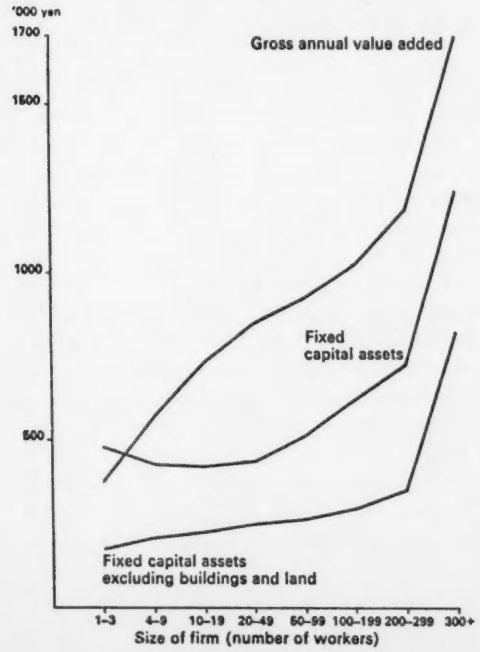
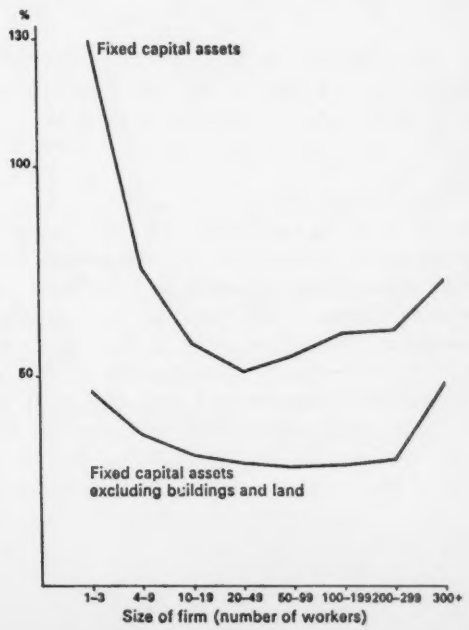


FIGURE 2. FIXED CAPITAL ASSETS AS PERCENTAGE OF GROSS ANNUAL VALUE ADDED IN JAPANESE MANUFACTURING BY SIZE OF FIRM, 1966



Output/labor ratio. The output/labor ratio, or productivity of labor (see upper curve in Figure 1) rises consistently with the size of enterprise in all industries with the exception of furniture and fixture manufacturing in the largest size group. The difference is much smaller in light industries than in heavy ones. The most striking example is clothing manufacturing; the notable exception is food processing. If instead of taking the size of enterprises we take the size of individual establishments, the same differences in respect of the various coefficients mentioned above hold good.

From these findings the following conclusions can be drawn:

(1) That small enterprises are less capital-intensive than large ones is true, in terms of the capital/labor ratio, if production equipment alone is considered; but it may not be true in the smallest size groups if overhead capital such as buildings, land and other infrastructure is included.

(2) The capital/output ratio is lowest (or the productivity of capital is highest) in enterprises with 20-49 workers. It is higher in the two smallest size groups than in the largest group; but the position is reversed if buildings and land are excluded.

(3) The productivity of labor rises steadily with the size of enterprise.

Thus the criticism that small enterprises require more capital and labor per unit of output and that they are therefore a costly means of employment creation is acceptable only for enterprises with fewer than 20 workers. There are a few points which must be borne in mind.

First, in Japanese manufacturing, with its multi-strata subcontracting system (under primary subcontractors there are secondary, tertiary and still lower-ranked subcontractors, each receiving orders, assistance and supervision from their parent firm one step up in the hierarchy) involving more than half of all enterprises (53 per cent in 1966), enterprises in different size groups are engaged in different production activities: e. g. assembly of cars by the largest enterprises and production of screws for cars by the smallest. This renders meaningless a simple judgement of relative efficiency on the basis of differences in microeconomic factors by size of enterprise. Indeed, it seems that the greatest merit of small enterprises as perceived in Japan lies not in the superiority of their coefficients but in the over-all savings in resources they make possible. Capital is saved by using the personal hoardings of small entrepeneurs and those of their relatives and friends. Utilization of such idle capital by small enterprises enables capital from organized sources (e. g. bank loans) to be concentrated in the larger-scale sector where it helps to accelerate technological progress and industrial growth.

Second, the lower productivities of capital and labor and the higher capital/labor ratio in the very smallest size groups are not sufficient reason for discouraging these enterprises. This is so because a very important proportion of the resources used by them has no opportunity cost: capital funds from entrepeneurs' savings, the part of their residences used as workshops, and the labor of family members (84 per cent of the labor force in the smallest size group and 28 per cent in the second smallest were accounted for by the self-employed and their family members in 1966). Many of these resources would never be put to industrial use otherwise. To the extent that this is true, there is no reason why they should not be used as they are.

Lastly, the relative positions of various coefficients by size of enterprises are not constant over time: changes in general economic conditions, relative prices and technology may influence them. For example, the capital/labor ratio in Japanese manufacturing was lowest in the smallest enterprises (those with 1-9 workers) and increased as they grew larger, according to the First Survey in 1957. At that time, therefore, Japanese data did appear to support the arguments in favor of small enterprises in developing countries. In those earlier years, when the shortage of capital in the Japanese economy was more serious, the smallest enterprises relied more heavily on cheap second-hand machinery; and the value of overhead capital (i. e. buildings, land and related infrastructure) formed a much smaller proportion of their total fixed capital assets. In 1962 overhead capital accounted for only 34. 3 per cent of the total fixed capital assets in the size group 4 - 9 workers, as compared with 51.5 per cent in 1966; the percentage for 1957 is not available but may have been much lower since 90. 8 per cent of the enterprises in the smallest group and 85. 7 per cent of those in the second smallest had their workshop attached to the entrepreneur's residence. [Comment: relative property or rental prices for land and buildings were rising sharply in Japan in the 1960s and may not be representative of such values in other countries.]

Taking all these facts into consideration, small enterprises seem to contribute most to the economic development of countries with surplus labor and shortage of capital under the following conditions:

(a) where they can be set up without heavy overhead capital expenditure on buildings, land and infrastructure;

(b) where diseconomies of small enterprises are compensated by the use of idle capital, labor and raw materials;

(c) where division of labor between enterprises in different size groups, e. g., in the form of subcontracting, enhances the over-all efficiency of the industry.

In many light industries -- particularly clothing, textiles, printing, pre-

cision equipment, furniture and fixtures, leather products, etc. -- small enterprises can operate without too great a disadvantage vis-à-vis larger ones. But there seems to be no good economic reason why smaller enterprises should be given preferential treatment, particularly as regards their overhead capital. Since they are usually at a disadvantage in the marketing of their products, their rate of expansion is likely to be much slower than that of larger enterprises.

The high cost of developing small enterprises

It may well be because they neglect the conditions listed that certain schemes for the promotion of small enterprises in developing countries have come in for a good deal of criticism. Also, the lack of skilled workers and managerial know-how, the difficulty of procuring raw materials, and other considerations may put smaller enterprises in these countries at more of a disadvantage vis-a-vis larger ones than is the case with their Japanese counterparts. Even if the productivities of capital and labor are lower than in large enterprises, the development of small enterprises will, as already mentioned, be advantageous to the economy if use is thereby made of otherwise idle resources. But it will be wasteful and economically unjustifiable if a large amount of capital which could be devoted more profitably to other purposes has to be spent on building factories, industrial sites and infrastructure specially for these enterprises. Unfortunately this is exactly what has been happening in India and some other developing countries, where the government has set up new small enterprises without any existing foundation to go on, as in the case of new industrial estates.

The over-all capital/labor and capital/output ratios of these schemes are naturally high, and they have been increased even further by the underutilization of newly built production facilities. About 346 industrial estates had been completed in India by the end of March 1969, but some 2,000 out of a total of 8,670 factory sheds provided remained unoccupied, and some of those that were occupied were being used for non-industrial purposes such as storage and residence. There is some evidence that the rate of utilization of capacity is much lower in the small-scale sector than in the larger. In bicycle manufacturing, for example, large manufacturers were operating, on the average, at 99.4 per cent of capacity in 1966, compared with 50.4 per cent in the small-scale sector. Similar differences had been observed in preceding years. A recent study indicates that the most important causes of this low level of capacity utilization are the shortage of raw materials, inadequate finance, lack of demand, and, in some industries, obsolete equipment. It is well known that smaller enterprises have much greater difficulties in getting import licences and raw materials at official prices and have to rely heavily on the black market. The study referred to found that 41 out of a total of 58 respondents had been able to secure less than 60 per cent of the imported materials

they needed, and 22 of these less than 30 per cent.

The smaller enterprises' difficulties in respect of finance are due not so much to the quantity of loan capital available as to the low quality of loan services and the ignorance of bank officials about local problems. There seemed to be a concensus among the small entrepreneurs I interviewed during a recent visit to India that financing fixed capital was no problem: the eagerness of the Government to promote small enterprises has made loans very abundant and cheap. The annual funds earmarked by banks for small enterprises often remain unexhausted at the end of the year. But repayments sometimes have to start before the commencement of business activities, which is often delayed by the non-arrival of machinery and raw materials ordered from abroad. Working capital is financed by banks on the basis of their assessment of the firm's requirements, which are calculated in terms of capacity of production and the official prices of raw materials. Production capacity is calculated on the basis of single shift working, however, even when the entrepreneur wishes to work more than one shift; and as we have seen, raw materials are often not available to small entrepreneurs at official prices, and prices on the black market keep rising while red-tape delays the granting of loans. All these shortcomings in loan services lead to the inefficient operation of small enterprises.

In order to encourage new graduates and diploma holders to set themselves up in business, the Indian Government has been granting them loans at extremely low cost. But the inexperience of these new entrepreneurs can itself contribute to underutilization of capacity. The geographical location of small enterprise development schemes is another factor that often helps to explain the underutilization of facilities. The rate of operation of industrial estates is generally lower in rural and semi-urban than in urban areas. Estates sometimes remain unoccupied simply because "industrialists are reluctant to move to places so far away from 'civilized life' and the mainstream of industrialization".

As regards small enterprises engaged in subcontracting, an important cause of their underutilization of capacity is the existence of similar facilities in their parent firms. Most of the large Indian enterprises are integrated plants which can produce nearly all the parts and components they require -- a legacy of the days when different developed countries built such factories according to their own specifications and installed their own equipment. Nevertheless, new subcontractors have been set up in deference to the principle of industrial decentralization, although the slow pace of industrial growth does not warrant such additional capacity.

So long as the development of small enterprises requires the provision of factory premises, industrial sites and infrastructure specifically for that purpose, and so long as production facilities are not operated at

capacity, this approach to industrialization and employment creation is bound to be a costly one. The establishment of additional small enterprises while existing facilities remain underutilized would simply aggravate the problem.

Problems encountered in industrial subcontracting

That the cooperation between large and small enterprises via subcontracting is one of the secrets of the success of small enterprises in Japan has been realized by some Indian policy makers. The Government has made it obligatory for large enterprises to subcontract part of their work to small ones, including those in the "ancillary industrial estates" attached to them. The thinking behind this policy is that with time these industrial complexes will attract other supporting industries and services and lead to the formation of a "growth center". Too often, however, this expectation is not fulfilled and the large units remain virtually isolated.

The difficulties of establishing subcontracting in developing economies are known. There is some truth in the argument that this sort of relationship can work properly only after an economy has reached a certain stage of industrialization and a certain amount of organization and technological experience has been accumulated. There are, however, some elements in the Indian approach which seem to have been making the task unnecessarily difficult and costly.

Restrictions on the growth of large enterprises. The Government urges that large industrial enterprises should increase subcontracting to small firms. "The country's resources are best utilized by a balanced distribution of capital investment in large- and small-scale industries. Decentralized production pattern has inherent advantages: it generates more job opportunities per rupee of investment." This view is contrary to the philosophy and experience in Japan, where subcontracting has spread as an aid to, and a consequence of, the concentration of scarce capital in the large sector. In India, however, the Government's enthusiasm for subcontracting derives to some extent from its distrust of the industrial "giants" and its desire to restrict their growth. In other words, an effective subcontracting system is regarded in India as a means of curbing industrial "monopolies", while in Japan it is regarded as a prerequisite to the growth and technical progress of larger firms.

The growth of parent firms has sometimes been restricted deliberately by the Indian Government. But this has an adverse effect on the development of the subcontracting system, since Indian "large" units are far too small to be efficient and maintain a large group of subcontractors. In the automobile industry, for example, India's total car production in 1971 was 91,223 units by eight assemblers located in different parts of the

country. Toyota, in contrast, assembled 2,080,000 units in 1972, nearly all of them in Toyota City.

Dispersal of large enterprises. Preoccupation with the decentralization of industries and the balanced economic development of the different regions has not only resulted in industrial location devoid of economic logic but also hinders the promotion of subcontracting. In view of the small size of the "large" units and the inadequacy of means of communication in India, which limit the extent of markets for subcontractors, the only efficient way of fostering subcontractors is to pool them among a number of parent firms in a given area. The fact that industrial estates in urban areas have been more successful than those in rural and semi-urban areas may be partly explained by the larger market available to the former. It can be demonstrated by the success of subcontractors on the estate of Hindustan Machine Tools (HMT) in Bangalore as compared with the less encouraging results of other ancillary industrial estates, e. g. in Bhopal and Ranchi.

Enterprises on the HMT estate are fortunate in that there are a number of large firms in Bangalore in addition to the HMT which feed them with orders. Experience gained over the years under the shelter of these large local enterprises has helped them to attain high enough standards to attract customers even from other parts of the country such as Bombay and Calcutta. (When I visited them in August 1972, they had been depending on HMT for only about 30 per cent of their total sales.) Not many other estates are in such a favorable position, being located in industrial deserts. Some of the ancillary estates appear to be unwanted accessories forced on to the parent firms by the Government. Years after their establishment the small enterprises there are operating below capacity and playing only a marginal role in the activities of the parent firms.

Reservation of markets for subcontractors. In order to secure markets for small subcontracting enterprises, the Indian Government reserves certain fields of manufacturing activities for them, and large enterprises are encouraged to use parts and components manufactured by them even if they are more costly (up to certain percentages) than their own products. In order to build up a strong base of subcontracting fairly quickly, it may have been necessary for the Indian Government to introduce such a regulation. But guaranteed markets for subcontractors and the forced use of inefficient subcontractors combined with the cost-plus pricing method adopted by parent firms will discourage efforts to improve industrial efficiency.

The relationship between parent firm and subcontractor. It is a widely publicized fact that Japanese subcontractors occupy

a more subordinate position vis-a-vis their parent firms than do their American and European counterparts. Indians categorically reject such a "feudal" or "captive" subcontracting system. This is an appropriate choice as a long-term goal. But it neglects one important fact: a "democratic" system pre-supposes equal bargaining power on both sides, i. e. that subcontractors are strong enough not to require assistance from their parent firms. When Japan's small firms first entered into a subcontracting relationship, many of them were weaker -- financially, technically, etc. -- than their American counterparts. They were dependent on their parent firms for survival, and the latter had to provide them with all kinds of assistance in order to make them capable and reliable enough. As Indian managers often point out, it costs a parent firm a lot to take care of subcontractors like this. If subcontractors moved to their competitors as soon as the original parent firm's assistance had equipped them to do so, which was the complaint of some of the directors of big firms I interviewed, no company would make such efforts seriously. The paternalistic and "captive" system in Japan spread as a means for promoting efficient subcontracting during the 1920s and 1930s and it was a natural outcome of economic necessity for some time after the Second World War. But a shift to the "democratic" pattern has been noticeable recently as a result of continued rapid industrialization and the subcontractors' growing strength. This kind of change is inevitable as the economy advances.

As already noted, parent firms in India often possess facilities for the production of subcontracted parts and components, and this undoubtedly makes them feel less dependent on subcontractors, while the fear of labor disputes also induces them to keep their relations with subcontractors as loose as possible. But parent firms that really do have to rely on their subcontractors inevitably become more paternalistic. It is not an accident that some firms which started with limited capital and therefore had to use subcontractors from the beginning (for example, Royal Enfield) are said to have developed a paternalistic and "captive" subcontracting system.

Summary and Conclusions

In small enterprises, the capital/output and capital/labor ratios tend to be influenced considerably by the relative importance of overhead capital, i. e. buildings, land and other infrastructure. Empirical findings in India showing that small enterprises require more capital per unit of output and labor than larger ones seem to be explained largely by this factor. The widespread underutilization of production facilities is another important explanation. In order to overcome these disadvantages and to enhance the contribution made by small enterprises to industrialization and employment creation, it seems essential: first, to improve the use made of existing capacity (e. g. by removing handicaps to small enter-

prises that result from the procedures for licensing of imports and capital loans, and restrictions on material supplies, etc.) rather than set up new enterprises; and second, to adopt a less formalistic approach, encouraging small entrepreneurs to draw more fully on unorganized idle resources (e. g. by using part of their residence as a workshop, private hoardings as capital, family members as labor). Even if their micro-economic coefficients are inferior to those of large firms, small enterprises deserve encouragement so long as the division of labor and the specialization it facilitates (e. g. by subcontracting) add to the over-all efficiency of the industry. In regard to the development of industrial subcontracting in India, the following points seem to deserve serious consideration:

(1) The basic reason for the isolated existence of many "large" enterprises in India is their small size and slow growth. Subcontractors cannot grow and multiply without the expansion of existing and potential parent firms. This is particularly true in a country like India, where large enterprises usually have integrated production facilities and where underutilization and duplication of production facilities are common both in parent firms and in subcontractors' factories.

(2) In this connection, anti-monoply regulations might well be reviewed. The monopolistic influence of certain industrial "dynasties" could be checked while allowing individual firms and factories to grow (in much the same way as the Japanese zaibatsu were dissolved after the Second World War). The spirit of competition could also be kept alive by appropriate trade and industrial policies, e. g. keeping the door open to competition from abroad. Tax or other measures could be devised to prevent the growth of excessive private earnings by top management.

(3) Given the vast distances and often inadequate means of communication in India, "large" enterprises (which as we have seen are in fact on the small side) are at present spread too widely and thinly to encourage the development of nearby supporting industries. These would benefit more if a few big units manufacturing similar products were to operate in the same area, thereby providing a sizeable market for the former's products.

(4) Reservation of certain fields of manufacturing for small subcontractors may be necessary to promote "infant" ancillary industries. But every effort should be made not to over-protect inefficient subcontractors. In the case of small firms which have been in operation for more than a certain length of time (say, five years), it would be advisable if in future loans were advanced with due consideration of their past performance (e. g. production, improvement of product quality and delivery), rather than of their production capacity.

(5) Different types of relationship between the parent firm and the subcontractor are relatively more advantageous at different stages of industrialization and the development of a subcontracting system. In the formative stages, it would not be wise to stick to the idea of a "democratic" subcontracting ststem.

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